

INSTITUTE OF GOVERNMENT
STUDIES LIBRARY
NOV 16 2000

UNIVERSITY OF CALIFORNIA



san dieguito lagoon resource enhancement program

December 7, 1979

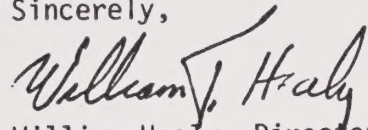
To All Interested Parties:

The City of Del Mar and the State Coastal Conservancy are pleased to release the San Dieguito Lagoon Resource Enhancement Program. The program seeks to provide a realistic, yet far-reaching plan for the restoration and enhancement of one of Southern California's few remaining coastal wetlands. It is also hoped that this program will serve as a prototype for enhancement of other wetlands, ensuring that these coastal ecosystems will continue to provide valuable wildlife habitat, open space, recreation and visual amenities for the future.

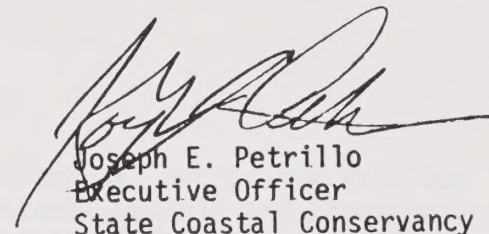
This document represents a full year of effort on the part of the Conservancy and City staff, the San Dieguito Lagoon Planning Committee, technical consultants and numerous public agency representatives. A two month review period produced agency and citizen comments which have been addressed in this final document. One of the key features in the development of this program is the enthusiastic participation by so many individuals attempting to pull together a project of such complexity. That this report could be produced is a tribute to the dedication of those community members, agencies and others who are committed to preserving and enhancing what remains of the coastal wetlands in California.

Now a demanding but exciting implementation program must be begun. Much work lies ahead and we are looking forward to continuation of the excellent support from governmental agencies and the public.

Sincerely,



William Healy, Director
Planning and Community Development
City of Del Mar



Joseph E. Petrillo
Executive Officer
State Coastal Conservancy



Digitized by the Internet Archive
in 2025 with funding from
State of California and California State Library

<https://archive.org/details/C101744406>

san dieguito lagoon resource enhancement program

DECEMBER 1979

(Second Printing September, 1980)

STATE COASTAL CONSERVANCY

1212 Broadway, Room 514
Oakland, California 94612
(415) 464-1070

CITY OF DEL MAR

1050 Camino del Mar
Del Mar, California 92014
(714) 755-9313

This document was prepared with financial assistance from the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, under the provisions of the Federal Coastal Zone Management Act of 1972, and the State Coastal Conservancy.

STATE COASTAL CONSERVANCY

Board Members

Huey D. Johnson, Chairperson
Margaret Azevedo, Vice-Chairperson
Dorill Wright
Mary Ann Graves
Jerome Snyder
Lois Ewen
Roy Bell
Hal Waraas

Staff

Joseph E. Petrillo
Executive Officer
Dennis Machida, Conservancy
Enhancement Projects
Coordinator
Bruce E. Jones, Conservancy
Project Manager
Judy Clark, Project Analyst

CITY OF DEL MAR

City Council

Al Tarkington, Mayor
Richard L. Roe, Mayor Pro tem
Gordon Denyes
Nancy Hoover
Hervey L. Sweetwood

Staff

Robert A. Nelson, City
Manager
William T. Healy, Director,
Planning and Community
Development
Katherine A. Jesch, City
Project Coordinator

STATE OF CALIFORNIA

EDMUND G. BROWN, JR
Governor

CONSULTANTS

Sea Sciences Services, Inc., San Diego: Engineering/Hydrology
Pacific Southwest Biological Services, San Diego: Biology
Gregory H. Vail: Map Graphics
Jeanine Moret: Illustrations

SAN DIEGUITO LAGOON PLANNING COMMITTEE

Don Coordt, Chairman

Dr. John Bradshaw
Karen Burger
Allan Carson
Ed Coughran
Gloria Hoff
Dr. Charles D. Keeling
Dr. Joseph Lang
Jeannie O'Toole

Margaret Porter
Dr. C. Bishop Spangler
Herb Turner
Gregory H. Vail
Dr. Nancy Weare
Dr. Gerald Winterer
Gene Yee

SPECIAL THANKS TO:

Bruce Browning, Department of Fish and Game
Earl Lauppe, Department of Fish and Game
Robert Radovich, Department of Fish and Game
Maeton Freel, U. S. Fish and Wildlife Service

TABLE OF CONTENTS

SUMMARY

Introduction.	.3
Program Significance.	.4
Physical Environment.	.5
Existing Land Use, Jurisdictions and Ownership.	.7
Enhancement Plan.	.8
Implementation.	12
Land Use Regulations.	18
Environmental Assessment of the Program	20

CHAPTER ONE: SAN DIEGUITO LAGOON PROGRAM INTRODUCTION

Program Background.	.1-2
Program Significance.	.1-4
Objectives.	.1-6
Environmental Impact Assessment	.1-7

CHAPTER TWO: SAN DIEGUITO LAGOON EXISTING ENVIRONMENT

Introduction.	.2-2
The Lagoon Setting.	.2-3
Natural Resources	.2-7
Habitat Types	2-7
Flora	2-11
Fauna	2-12
Geology	2-20
Soils	2-20
Hydrology	2-21
Development and Use Features.	.2-23
Governmental Jurisdictions	2-27
Land Use and Ownership Patterns	2-27
Existing Land Use Regulations	2-29
Recreational Access	2-31
Vehicle Circulation	2-32
Summary of Enhancement needs.	.2-33

CHAPTER THREE: SAN DIEGUITO LAGOON ENHANCEMENT PLAN

Introduction	.3-2
Design Criteria.	.3-5

Components of the Plan.	3-9
Improvements of Tidal Areas	3-9
Wildlife Habitat Improvements	3-14
Improvements for Public Access	3-17
Potential Additional Uses	3-20

CHAPTER FOUR: SAN DIEGUITO LAGOON PLAN IMPLEMENTATION

Introduction.	4-2
Agency Responsibilities	4-5
Agency Roles	4-5
Cooperative Agreements	4-7
Proposed Acquisitions	4-9
Permits and Approvals	4-11
Site Construction and Improvements.	4-14
Monitoring, Maintenance and Policing.	4-21
Costs and Funding	4-23

CHAPTER FIVE: SAN DUEGUITO LAGOON LAND USE REGULATIONS

Introduction.	5-2
Zoning.	5-3
Supplemental Controls	5-9
Watershed Management.	5-12

APPENDICES

Recommended Actions for Public and Private Agencies	A
Phased Implementation of Site Construction Work	B
Review of the Hydrology and Tidal Influence in the San Dieguito Lagoon.	C
General Guidelines for Coastal Lagoon Management.	D

GLOSSARY/REFERENCES

LIST OF EXHIBITS (Charts and Maps)

Wetland Definitions Chart.	2	Proposed Project Map	3-11
Lagoon "Before and After" Chart.	17	Access/Circulation Plan Map.	3-16
Regional Setting Map	2-4	Proposed Acquisitions Map.	4-8
Present Environment Map.	2-6	Chart of Agency Permits and Reviews.	4-12
Vegetation Habitats Map.	2-8	Proposed Project Map: Phase One.	4-16
Rare/Endangered Species Map.	2-14	Proposed Project Map: Phases Two and Three	4-18
Wildlife Habitats Map.	2-16	Proposed Project Map: Phase Four	4-19
Jurisdictions Map.	2-24	Proposed Zoning Map.	5-4
Land Use/Access Map.	2-25	Chart of Zoning Descriptions: Del Mar.	5-5
Land Ownership Map	2-26	Chart of Zoning Descriptions: City and County of San Diego.	5-7
Zoning/Floodlines Map.	2-30	Buffer Area Map.	5-8
Area Reference Code Map*	3-10		

* Also reproduced on inside back cover.



summary

san dieguito lagoon resource enhancement plan

"WETLAND"

"MARSH"

"ESTUARY"

WHAT ARE THEY?

"The estuary and tidal marsh are extraordinary natural systems in which tidal energy circulates nutrients, animals feed on plants and on each other, and excess nutrients are washed out to feed the organisms which live offshore."

(Our Nation's Wetlands, An Interagency Task Force Report coordinated by the U. S. Council on Environmental Quality, 1978)

"Wetlands" are areas that are inundated by surface or ground water with a frequency sufficient to support a prevalence of vegetative or aquatic life that requires saturated soil conditions for growth and reproduction.

(Presidential Executive Order 11990, 42 Fed. Reg. 26961, 1979)

A "marsh" is one form of a wetland, either freshwater or salt, which is dominated by nonwoody plants (especially grasses and sedges) often developing in a shallow depressions, river margins, tidal areas, and estuaries. "Salt Marshes" (and salt water swamps) account for only 10% of the nation's wetland resources.

(U. S. Council on Environmental Quality, 1978)

An "estuary" is a semi-enclosed coastal body of water which has a free connection with the ocean, is tidally influenced, and experiences mixing of seawater with freshwater from land drainage. Estuaries often contain marshes along their edges.

A "lagoon" is a narrow inlet connected to the sea that extends inland and often has some freshwater drainage entering it, but not to the degree as does an estuary.

Much of the lagoon's narrow interior can be marshy.

introduction

The San Dieguito Lagoon Enhancement Program is a joint effort of the State Coastal Conservancy and the City of Del Mar to restore and enhance a degraded wetland on the San Diego coast. The program was developed in support of a resource enhancement project of the Conservancy and will be proposed as a part of the Local Coastal Program (LCP) now being prepared by the City of Del Mar in accordance with the California Coastal Act of 1976.

Conservancy involvement in the enhancement program was initiated at the request of the City in late 1978. The Conservancy awarded a planning grant to the City and authorized Conservancy staff to help develop a program for the revitalization of San Dieguito Lagoon. In preparing this program, Conservancy and City of Del Mar staff have relied heavily on an analysis developed for the lagoon in 1977 by the Cal Poly Coastal Design Group, on a Department of Fish and Game study of the lagoon, and on the studies of private consultants engaged specifically for the enhancement program. The program has been prepared in close consultation with the San Dieguito Lagoon Planning Committee (a citizens advisory group),

California Department of Fish and Game, U.S. Fish and Wildlife Service and other agencies with jurisdiction over the lagoon.

The lagoon enhancement program has three major components: 1) the lagoon enhancement plan (chapter 3 of this document), which identifies appropriate activities for the lagoon and surrounding lands and site improvements to support these activities; 2) the implementation plan (chapter 4), which describes appropriate means for carrying out the desired site improvements, proposes land acquisitions, outlines desirable management arrangements and responsibilities, and identifies appropriate funding sources for each element of the enhancement program; and 3) proposed land use regulations (chapter 5), which are part of the Del Mar Local Coastal Program. The LCP material was prepared by The City of Del Mar to satisfy requirements of the Coastal Act of 1976 and will be submitted separately to the Coastal Commission.

Chapter 2 contains an inventory of existing conditions and assessment of enhancement needs and opportunities at the lagoon. Supporting technical appendices are found at the end of this document, and a substantial amount of technical information is contained in the consultants' report, available at the Del Mar Planning Department and at the Conservancy office.

program significance

Coastal marshes and estuaries are among the most productive and valuable ecological systems in the State. They produce large quantities of food for both marine and terrestrial organisms along the coast and provide essential habitat for hundreds of fish and wildlife species. Marine fish enter coastal wetlands to feed and also use them as breeding and nursery grounds. According to the Council on Environmental Quality, about one-half of the commercial fish and shellfish harvest on the Pacific Coast is dependent on California coastal wetlands. A large variety of migratory shorebirds and waterfowl spend the winter or stop for shorter periods in these areas during annual migration. In addition many species of wading birds, other water-associated birds, and raptors are supported by coastal wetlands. Five endangered bird and mammal species are totally dependent on these areas (see Glossary).

San Dieguito Lagoon is one of the relatively few wetlands remaining on the Southern California Coast, an area which has lost 75 percent of its valuable wetland acreage since the time of European settlement and which continues to be subject to intense pressures for development. San Dieguito Lagoon itself has been reduced from 600 to 200 wetland acres since the turn of the century, and

suffers from a history of sewage discharges, water diversions, sedimentation, human and pet intrusion, and other disturbances. In spite of the degradation in habitat quality, the lagoon remains a highly significant wildlife area. It has been identified by the California Department of Fish and Game and the Federal Bureau of Sport Fisheries and Wildlife as one of the 19 coastal wetlands of top priority for acquisition in the State. The lagoon's ecological significance and restoration potential have also been recognized by the California Coastal Commission and the Cities of San Diego and Del Mar. The rare combination of high biological and aesthetic value, high potential for restoration, and high pressure for development at San Dieguito provides the opportunity to balance a complex array of demands within the context of the 1976 Coastal Act.

The San Dieguito Lagoon program can serve as a prototype for enhancement of other lagoons in California. Lessons learned in this effort developed a greater understanding of what is needed in an ongoing coastal wetland management and restoration program.

physical environment

The San Dieguito Lagoon is located on the northern edge of the City of Del Mar, a rapidly growing coastal community about 20 miles north of San Diego Bay. The lagoon is a 200-acre remnant of a 600-acre area of marshland and tidal channels that once existed at the mouth of the San Dieguito River. The planning area encompasses approximately 650 acres. This area contains the lagoon system of channels and marshes, surrounding lowlands and bluffs. The project area is bounded by the ocean shoreline to the west, Interstate 5 to the east, Via de la Valle to the north, and the bluffs and the mouth of Crest Canyon to the south. (See map page 2-6)

The main channel system of the lagoon consists of a single, east-west-running, shallow channel with a fishhook-shaped south fork. A narrow strip of salt marsh borders the western portion of the lagoon, broadening to the east where the channel forks.

Over the past 70 years, the lagoon has been degraded by a series of development activities. With the construction of Lake Hodges Dam in 1918, the supply of fresh water to the lagoon was drastically reduced, allowing silt

to build up in the lagoon and contributing to periodic closure of the lagoon mouth. The dam also deprived the lower San Dieguito River valley of most of its aquifer recharge supply, leading to the degradation of groundwater quality (and consequently to the abandonment of farming at the lagoon in the 1930's).

In 1936, over 200 acres of lagoon wetlands were filled in the construction of the Del Mar racetrack/fairgrounds complex. The construction of a small airfield, Highway 101 (now Camino del Mar), and Interstate 5 also replaced a large portion of the wetland area with fill. The lagoon's wetland area was further reduced by the construction of a diked sewage oxidation pond, which was used by the City of Del Mar until 1975.

As a result of these activities, the physical characteristics of the lagoon reflect in part a degraded biological system. Due to the alteration of freshwater flows and the cessation of tidal influence, the lagoon water pattern is characterized by extreme variances in salinity, poor circulation, and varying water surface. As the

result of these conditions, aquatic faunal diversity has been minimized (only ten species of fish have been identified). The ability of the system to rid itself of pollutants from animal wastes, plant nutrients, and sediments has also been limited. Further, the lack of circulation in the lagoon system has resulted in stagnant water which facilitates the breeding of mosquitoes. The inability of the system to quickly transport water to the ocean has led to flooding of low lying areas during the wet season.

In addition, the hydrological characteristics of the lagoon and the loss of wetland acreage to landfill have resulted in the relative shortage of several habitat types such as freshwater marsh and mudflats essential for maximum species diversity and biological productivity. In particular, there is a shortage of feeding and nesting areas for the endangered least tern and Belding Savannah Sparrow.

Further, the lagoon and surrounding environs are visually degraded by litter and the lack of vegetation in certain areas.

Finally, human and domestic animal intrusion have disrupted sensitive vegetation and habitat areas. Dogs have disrupted at least one least tern nesting attempt. Foot traffic is threatening the Prostrate Hosackia, a rare and endangered plant in the coastal dune areas.

In spite of the degraded nature of the lagoon and surrounding lands, San Dieguito Lagoon retains high value as habitat for a large number of wildlife species. A variety of habitats still exist at the lagoon--coastal dunes, channels, mudflats, pickleweed salt marsh, salt flats, brackish marsh, riparian vegetation, maritime grassland, and coastal sage scrub. For its size, the lagoon supports a highly diverse bird population-- 73 upland and 54 water-associated species.

Existing land use, jurisdictions and ownership

Del Mar is the southernmost of six small but rapidly growing beach communities in the northern portion of San Diego County. To the south and east, it is bordered by the City of San Diego; to the north, by the unincorporated community of Solana Beach.

Population growth in the northern portions of the San Diego coast region has increased substantially in recent years and is expected to continue to increase at a high rate.

Significant development has encroached into the lagoon area itself, including the 225 acre Del Mar Racetrack and Southern California Exposition complex, five road and rail crossings of the lagoon channels, an abandoned airfield, oxidation ponds, a recreational vehicle park, a golf driving range, various other commercial uses, some light industry and some residential development.

Parts of the lagoon have been historically used for farming, but this activity had to be abandoned in the late 1930's due to degradation of groundwater quality caused by overdraft and by the construction of Lake Hodges Dam, which deprived

the lower valley of most of its aquifer recharge supply. The San Dieguito Valley east of Interstate 5 is still used for grazing during part of the year, but no economically viable agricultural land exists in the planning area west of the freeway. The upland area south of the San Dieguito River was cleared for the construction of the Del Mar Airport runway, buildings and concrete bunkers, which were used during World War II. The buildings were subsequently used for light manufacturing industry, but were demolished in 1970. Several paved or dirt roads still criss-cross this area.

Four governmental entities have general jurisdiction over the planning area: The City of Del Mar, the City of San Diego, the County of San Diego, and the 22nd District Agricultural Association. Except for the racetrack/fairground complex, which is owned by the State of California, and some smaller parcels owned by the City of Del Mar and the City of San Diego, the land within the planning area is privately owned. The principal private ownerships are the Scripps Clinic and Research property (23.4 acres), the Del Mar 88 property (101.7 acres), and the Moshtaghi property (87.7 acres).

enhancement plan

The primary objectives of this enhancement plan are to protect and enhance the esthetic and ecological values of the lagoon and to provide opportunities for public access, recreation, and education consistent with protection of natural and scenic resources. Protection of the lagoon is based on the zoning and land use regulations outlined in the last chapter.

In order to guide the enhancement work, several "design guidelines" were developed, as described below (and at page 3-5).

1. The integrity of existing functioning natural systems should be disturbed as little as possible.
2. Land alterations should expand the water surface (with increasing the depth of channels a secondary function) to improve the tidal prism and increase aquatic habitat.
3. Land alterations should create a pattern of water circulation and flushing to reduce mosquito breeding, stagnation, and pollutant buildup.
4. Land alterations should be located to reduce the risk of their being destroyed by floods.
5. Endangered bird species should be isolated from human and animal intrusion and their habitat should be protected from adverse impacts of site alterations.
6. The diversity of the spatial pattern of habitat types should be increased and ecotones (transition zones between different habitat types) should be developed.
7. Recreational access for educational viewing should be controlled and sited to minimize adverse impact on wildlife.
8. Any physical structure, roadway improve-

ment, etc., should be located and designed to protect wetlands, scenic values, and wildlife habitat.

Based on these design guidelines, the following site improvements and actions are proposed:

- construction of tidal basins
- enlargement of channels
- creation of a freshwater marsh
- establishment of a least tern preserve
- enhancement of several wildlife habitat areas
- a general cleanup of the lagoon
- improvement of pedestrian trails and viewing points (with educational signs)
- construction of a permanent entrance to the reserve

A few roadway realignments or improvements which would not harm the lagoon are also recommended for safety reasons or for maintenance access to the lagoon. The plan also suggests the following potential additional uses for future consideration: an aquaculture facility, a biological sewage treatment system, preserves for rare coastal plants, a youth hostel and a nature study center. The following sections discuss each site improvement and activity in greater detail.

Tidal Basins Three tidal basins would be constructed along the lagoon channels (for the code references refer to map on inside back cover):

1. The "railroad triangle" (Area IV): a 3.5-acre parcel of vacant land, now separated from the lagoon's west channel by the railroad embankment, would be excavated and joined to the west channel by a pipe.
2. The northern tidal basin (Area IX-C): an abandoned 9.5-acre sewage oxidation pond adjacent to the salt marsh at the channel fork would be excavated and connected to the south channel with a new channel.
3. The southern tidal basin (Area X): the area adjoining the eastern arm of the Fishhook would be excavated and graded to create a 10.1-acre tidal basin and 5.7 acres of mudflats.

The primary purposes of the tidal basins are to increase the lagoon's tidal prism and to increase its aquatic habitat area. The proposed channel and basin enlargements will expand the area of the lagoon subject to tidal action (that is, the area below the elevation of mean higher high water) from about 40 to 70 acres, and is expected to increase the tidal prism by over 50 percent. Although there is no guarantee that this increase will ensure a permanently open lagoon mouth, it will keep the mouth open for a longer period and reduce the need to breach the sand bar mechanically.

Channel Improvements With the construction of tidal basins, the south

lagoon channel would be widened and deepened and the tip of the Fishhook extended north-west to join with the south channel. The primary benefits of these alterations would be to increase the tidal prism and provide additional habitat for aquatic species. By connecting the Fishhook to the south channel, a 20-acre interior island would be created, which would provide high quality salt marsh habitat for wildlife and would be protected from human and domestic animal intrusion by the encircling channel. The north and west channels would also be dredged to increase flood carrying capacity

In addition to enlarging the main lagoon channels, minor alterations of small marsh channels are proposed to improve water circulation in four areas: the marsh and pond area just east of Camino del Mar (Area II), the marsh at the channel fork (Area IX-B), the winter marsh (Area X-C), and the interior island created by the Fishhook extension (Area X-B).

It is also proposed that the mouth of the lagoon be opened on an experimental basis if the increased tidal prism is insufficient to keep the lagoon open naturally and if severe stagnation or flood hazards result in the closed lagoon. Finally, in the long term, dredging of the main river channel would reduce the flood hazard in the lagoon.

Freshwater Marsh The enhancement plan proposes converting the abandoned 14 acre oxidation

pond (adjacent to the north channel and Interstate 5, Area VII) a freshwater marsh with island suitable for bird nesting. Conversion would require minor excavation, grading and supplying the pond with water. Water losses from evaporation would be replaced by two windmills pumping ground water. The freshwater wetland habitat would increase habitat diversity and benefit the overall species diversity and biological carrying capacity of the lagoon.

Endangered Species' Habitats The new salt marsh, mudflat and open water areas will provide additional feeding habitat for least terns and feeding, resting, and nesting habitat for Belding's Savannah Sparrows. The plan also proposes enhancement of nesting habitat for least terns in three areas, all of which will be covered with light-colored sand favored by terns.

1. Northern tidal basin: An area of higher ground in the salt marsh just west of the proposed tidal basin (Area IX-B) would be raised further.
2. Southern tidal basin: In extending the Fishhook to meet the south channel, a small island of higher ground would be left within the Fishhook channel extension (Area X-B).
3. Overflow Parking lot: A 12-16 acre Parcel between Jimmy Durante Blvd. and the north channel (Area VI) would be protected by fencing. The parcel, an overflow parking lot for the racetrack and fairgrounds during the summer, is one which the terns have used traditionally for nesting but with no success recently due to disturbance by domestic animals and people.

Upland Habitat Enhancement. In all upland areas of the proposed ecological reserve (largely Areas IX and X), the plan proposes clearing of rubble and weeds and revegetating with native species. In their present disturbed condition these upland areas receive only limited use by wildlife. The recommended improvements would increase the habitat value of these areas, thereby increasing the abundance and diversity of wildlife at the lagoon. The plan also recommends preserving and vegetating a portion of the coastal dunes near the lagoon mouth (Area I).

Scenic Improvements. All the site improvements described above would substantially improve the scenic quality of San Dieguito Lagoon by creating greater vegetative diversity, more open water and less stagnation. A general clean-up of debris throughout the lagoon would enhance scenic value further.

Recreational and Public Access Improvements. A need exists to provide recreational and educational opportunities but also protect the lagoon. The enhancement plan therefore recommends (1) that the existing trail along the south bank of the lagoon be improved and that "pedestrian access" signs be posted; (2) that Grand Avenue be maintained but that a gate be constructed at its intersection with San Dieguito Drive, to restrict access to maintenance vehicles; and (3) that two viewing sites be improved, a pedestrian overlook in Area II and the proposed lagoon reserve entrance at the intersection of Jimmy Durante Blvd. and San Dieguito Drive. In

addition, there will be construction of an informational kiosk at the intersection of Jimmy Durante Blvd. and San Dieguito Drive, installation of educational signs around the lagoon reserve, and initiation of a program of public involvement in lagoon restoration, maintenance and educational tours. Active recreational use (volleyball and other sandlot sports) of the least tern nesting preserve in Area VI would be encouraged in the "off-season" (September-March), when the terns are not nesting.

Vehicle Circulation Improvements.

Maintenance, but not expansion, of Grand Avenue is recommended. Widening of San Dieguito Drive to serve new residential development should be allowed if filling of the waterway can be avoided. Reconstruction of Jimmy Durante Bridge is recommended for safety and traffic flow reasons.

Potential Additional Uses. The enhancement plan recommends further study of several possible additional uses for the lagoon and surrounding lands: (1) a youth hostel or similar overnight facility on the 20-acre "Snakewall" property just west of San Dieguito Drive; (2) preserves for rare coastal plants in the lagoon wetlands; (3) an aquaculture facility in the lagoon or the former lagoon area east of I-5; (4) a biological sewage treatment system in the lagoon or former lagoon area east of I-5; and (5) an interpretive center.

implementation

The implementation plan addresses the following:

1. Delineation of proposed ownership and management responsibilities;
2. Identification of short and long-term costs, including acquisition, site development, operation, and maintenance;
3. Design of mechanisms to meet project costs and allocation of funding responsibilities; and
4. Allocation of initial implementation responsibilities.

In order to permanently enhance the lagoon, a complex set of ownership, management and financing arrangements must be established. These arrangements are discussed below.

Ownership. The goals of lagoon enhancement and protection will best be met through some form of public ownership control over key areas in the planning area. Though 250 acres of the project area (totaling 650 acres) are publicly owned, virtually all of the wetland and eastern upland area are in private ownership (excluding tidal areas belonging to the State of California's sovereign lands).

The implementation plan proposes public ownership or control (dependent upon availability of funds and negotiations with land owners) over the following parcels (totaling 219.2 acres):

1. The 23.4-acre Scripps Clinic and Research Foundation property along Highway 101 west of the railroad in the northwest corner of the project site ;
2. The 2.9-acre Jefferson parcel (underwater) along Jimmy Durante Blvd. which is now subject to Public Trust easements;
3. The 101.7-acre Del Mar 88 property east of the Fishhook ;
4. The 87.7-acre Moshtaghi property in the southern end of the project area; and
5. The 3.5-acre railroad right-of-way owned by the Santa Fe Railroad.

Management. The implementation plan identifies the City of Del Mar and the Department of Fish and Game as the primary management agencies for the lagoon. A cooperative agreement between the two agencies is proposed to establish joint responsibilities for monitoring, maintenance and policing of the lagoon.

These agencies will be responsible for handling a number of management concerns, including control of any mosquito problems, inspection and maintenance of any physical improvements such as culverts and pumps, removal of debris, control of nuisance vegetation, policing against trespass and domestic animal intrusion, and implementation of a scientific monitoring program.

Financing. The implementation of the enhancement plan could cost approximately \$2.3 million unless identified cost savings are realized. Of this amount, a preliminary estimate of the cost of acquisitions has been placed in the range of \$1.5 million for 220 acres of land. (This estimate is a preliminary sum which is not based upon a formal appraisal. Acquisition is dependent upon the availability of funds and negotiations with land owners.) Public Trust interests, which must be determined by the State Lands Commission in coordination with the acquisition program, may exist over a portion of these properties. The identification of such interests could reduce the ultimate acquisition costs.

Site improvement costs for all elements of the enhancement plan could total within the range of \$750,000-\$900,000 if let to private contractors. Cost saving measures, including the use of State owned heavy

equipment and crews, are possible and have been identified in the plan.

Ongoing manual management costs (excluding scientific monitoring costs) are estimated to be \$50,000. This amount reflects two personnel years of effort needed to manage the lagoon by the City of Del Mar and the Department of Fish and Game. This cost would be covered from each entity's operational budget.

Several possible sources of funding for the acquisitions and site improvements have been identified, including the Wildlife Conservation Board, Department of Fish and Game, the Conservancy, and the Environmental Protection Program on the State level. At the Federal level, the Land and Water Conservation Fund, U.S. Soil Conservation Service's Small Watershed Act funds, and the Army Corps of Engineers' Small Flood Control Project funds. In addition, in-kind services will be required from the Department of Fish and Game, the City of Del Mar, the California Conservation Corps, the U.S. Fish and Wildlife Service, and the Conservancy.

Implementation Responsibilities. Pursuant to a cooperative agreement, the City of Del Mar and the Department of Fish and Game are designated as the lead agencies for this project.

The plan proposes that the Department of Fish and Game, in conjunction with the Wildlife Conservation Board, would be responsible for acquisition of land needed to implement the plan (when funds become available); providing technical assistance in designing site improvements; and, jointly with the City of Del Mar, managing the lagoon.

The City of Del Mar will be responsible for the appointment of a lagoon coordinator; undertaking enhancement activities such as a nuisance abatement program; coordinating planning and implementation efforts of other interested agencies; obtaining needed permits; and, jointly with the Department of Fish and Game, managing the lagoon.

The assistance of the Conservancy is needed to implement the lagoon enhancement plan. Specifically, the following principal roles for the Conservancy are proposed:

1. Provision of technical assistance to the City of Del Mar in coordinating the planning and enhancement activities of the many State and Federal agencies involved in this program.
2. Development of an ecological monitoring program for the City of Del Mar and Department of Fish and Game to document the effects of the enhancement activities and to provide information for future implementation phases.
3. Provision of funding assistance to the City of Del Mar in the amount of \$70,000 to cover program start-up and site improvement costs for

the initial phase of this program (see page 4-24).

4. Assistance to the City of Del Mar in obtaining funding for the remaining phases of the program.

The implementation of this program will require close coordination with a number of State and Federal agencies such as the Department of Fish and Game, Wildlife Conservation Board, the 22nd District, the California Coastal Commission, the California Conservation Corps, the Regional Water Quality Control Board, the U. S. Army Corps of Engineers, and the U. S. Fish and Wildlife Service. See Appendix A for a list of the proposed actions by 15 agencies.

Implementation Phasing

In recognition of the need to initiate this program as soon as possible and the complexity of this program, the implementation plan proposes that the program be implemented in six phases. The phasing, which is keyed to land ownership considerations, availability of funds, and type of enhancement work and equipment needed, is designed to allow adequate preparation for each enhancement activity and realization of potential cost savings.

Phase One

Phase One includes those actions which can be undertaken on land already publicly owned or in the public trust, or for which minimal acquisition or lease funding would be needed, and for which the actual work can be done largely by manual labor without the need for heavy equipment. This phase also does not require complex permits or impact assessment documentation. Elements in this phase would serve to build the project's local visibility and to develop momentum for the completion of the other phases. These elements include:

1. The City of Del Mar would appoint a full-time Lagoon Coordinator to oversee and coordinate all lagoon actions throughout all six phases.
2. The City of Del Mar would conduct a Public Involvement Program which would encourage continued citizen

involvement in the enhancement process. Included tasks are: the design of the lagoon entrance and kiosk (Area V); design and placement of information signs for the lagoon reserve; solicitation of donations of materials and services; and the organization of a Spring 1980 clean-up of litter, waterway snags, and safety hazards, in cooperation with the California Conservation Corps.

3. Upon the negotiation of an arrangement with the 22nd Agricultural District for the racetrack's overflow parking site, the City of Del Mar and DFG would establish the area as a least tern preserve (Area VI). The transfer should be accomplished, and an alternative parking site located, pursuant to the Fairgrounds Master Plan now being prepared. Protective fencing will be necessary, as will the deposit of light-colored sand to encourage tern nesting. Costs of fencing, supplies and equipment are estimated at \$12,800. Sand is available from the Crest Canyon alluvial fan deposited as a result of heavy rains over the past two winters. Labor would be provided by the California Conservation Corps.
4. Following State Lands Commission findings of public trust, the City of Del Mar, using California Conservation Corps work crews, would do the minor channel and water circulation improvements at three sites: the marsh and pond area just east of the Camino del Mar bridge (Area II); the marsh at the channel fork (Area IX-B); and the winter marsh area (Area X-C).

5. Following the negotiation of a lease or acquisition of the Santa Fe Railroad property (Area IV), the City of Del Mar and work crews from the California Conservation Corps and Department of Fish and Game would establish a tidal basin. Site improvements would include some earth movement and installation of a pipe with a flood control gate connecting the new marsh to the west channel. Earthmoving costs are estimated at \$30,000 and pipe installation costs at \$17,000 if let to private contractors.

Phase Two

Phase Two includes the development of the northern tidal basin and nesting island (Areas IX-A-D), which would be possible upon public ownership or control of the Del Mar 88 property (101.7 acres). This phase would require heavy equipment, such as trucks, swamp cats and possibly a dragline. Tasks would include the reconstruction of levees and excavation of channels connecting the tidal basin with the south channel, and creation and enhancement of a least tern nesting island. Site improvement costs are estimated at \$200,000. It is proposed that the Wildlife Conservation Board carry out the acquisition and fund the site improvements.

Phase Three

This phase involves the conversion of the sewage oxidation pond presently owned by the City of San Diego to a freshwater pond and marsh

and the creation of two additional bird nesting islands (Area VIII). Action would depend upon the negotiation of a low cost lease for the site. The City of Del Mar currently holds an option to lease the site.

Work tasks include repair of levees and clearing of vegetation from the bottom of the pond, the creation of two bird nesting islands, the filling of the marsh with 70 acre-feet of water from the San Dieguito River or from winter runoff, and the erection of two windmills to pump in ground water to replace water loss.

Site improvement costs are estimated at \$5,000 for the rental of equipment (this phase can use some of the same equipment that would be used in Phase Two) and \$17,200 for the two windmills. The California Conservation Corps and DFG would provide work crews to assist in construction. The City of Del Mar and the Conservancy have applied for funds from the California Environmental Protection Program.

Phase Four

The actions in Phase Four would take place when the Moshtaghi property is under public ownership. The Wildlife Conservation Board is currently pursuing acquisition of this property. These activities would also involve the use of the heaviest equipment, probably including a suction dredge.

Work tasks would include the creation of the tidal basin, installation of a pipe connecting this basin

with the northern tidal basin, dredging of the Fishhook channel, and enhancement of created islands for least tern nesting (Areas X-A-C). The cost of these improvements is estimated at \$270-400,000 (depending on the type of equipment used). These costs could be met from funds from the Wildlife Conservation Board, The Department of Fish and Game and the Federal Land and Water Conservation Fund.

Phase Five

This phase involves the upland habitat enhancement including clean-up and removal of debris from upland areas (primarily in Areas IX and X) and replanting them with native vegetation. This activity would be carried out by DFG pursuant to its regular management duties once the land is under public management.

Phase Six

This phase involves the dredging of the main channel of the San Dieguito River and the northern portion of the South Channel to the Grand Avenue bridge for flood control purposes and to enhance the lagoon's tidal flushing. Cost is estimated at \$250,000 which is potentially available from the Soil Conservation Service's "Small Watershed Project" funds or from the Corps of Engineers' "Small Flood Control Project" funds. A substantial lead time (2 to 4 years) is necessary to secure aid from these programs.

COMPARISON OF SAN DIEGUITO LAGOON--"BEFORE AND AFTER" ENHANCEMENT

FEATURE	BEFORE	AFTER
PLANNING AREA	650 Acres	Lagoon Reserve - 225 Acres Lagoon Buffer Area - 200 Acres Fairgrounds/Racetrack - 225 Acres
TOTAL OPEN WATER (Measured at one foot above Sea Level-- The approximate Sill)	About 31 Acres	About 60 Acres
MUDFLATS	About 3 Acres	About 8 acres.
PICKLE WEED SALT MARSH	About 117 Acres	Same (some losses will be replaced and revitalized).
FRESHWATER MARSH	Isolated areas, including winter rain ponding area	About 14 Acres (pond and marsh) in addition to existing areas
UPLAND VEGETATION	About 325 Acres	About 292 Acres
SAND DUNES	About 4 Acres	About 4 Acres (one--or less--in preserve)
DRY SAND FLAT (including least tern areas)	About 26 Acres	About 30.5 Acres

land use regulations

Adequate land use regulations are essential to ensure that appropriate land use, structural design and erosion control measures exist to protect the San Dieguito Lagoon from the impact of development occurring in and adjacent to the lagoon. The development of adequate land use controls is a condition precedent to and independent of implementation of the proposed enhancement work. The proposed land use regulations (see Chapter Five) include zoning within the lagoon area and provision for a buffer area surrounding the lagoon.

It is recommended that the Local Coastal Program retain existing zoning for most of the lagoon areas within the City of Del Mar. This includes Floodway (FW) for the area between San Dieguito Drive and Jimmy Durante Blvd. and along the west channel of the San Dieguito River, which prevents any uses which would be damaged by or cause restriction of flood flows.

The southern side of the river's west channel is zoned North Commercial (NC), allowing low-intensity commercial uses. While the majority of this area should be maintained in this zoning, in order to allow the implementation of the proposed tidal basin on the Railroad parcel, that parcel is recommended for Public Park (PP) zoning.

Zoning within the City of Del Mar also includes low to medium density residential uses on the slopes at the southwestern edge of the project area,

and zoning for railroad purposes along the Santa Fe Railroad tracks.

The fairgrounds/racetrack complex is included in an FR Zone; leaving development decisions up to the 22nd District Agricultural Association which owns the property. No change is proposed in the FR designation, but it is recommended that recreation-oriented uses in that zone shall be limited to those proposed in the 22nd District Master Plan, as certified by the Coastal Commission in the City of Del Mar's LCP.

Zoning recommendations are also made for portions of the project site within the City of San Diego and the County of San Diego jurisdictions. It is recommended that the County's agricultural area immediately north of the fairground/racetrack complex and the City of San Diego A-1-10 (agricultural, allowing one dwelling per 10 acres) zoned area immediately east of the racetrack be annexed to the City of Del Mar and zoned with Del Mar's designation, permitting only uses related to the recreational facilities at the racetrack.

It is recommended that the Floodway (FW) zoning for the floodway area in the City of San Diego be retained. The A-1-10 zone at the southeastern end of the project area will be retained until such time as public acquisitions are completed. Finally, it is recommended that the zoning on the hillside south of the lagoon be changed to reduce the residential density currently

mitted to a maximum of one unit per two acres in accordance with recent Coastal Commission permit decisions.

A 225-acre ecological reserve would be created, with a surrounding buffer area of about 200 acres. The 225-acre fairgrounds/racetrack complex and associated commercial facilities are designated for recreational and visitor-serving uses. Ecological reserve status is proposed for San Dieguito Lagoon to allow site alteration for enhancement purposes and to protect the lagoon from future development and unrestricted human access. The proposed ecological reserve would include the lagoon channels and the open wetland and upland area between the north channel and the Fishhook. A buffer area would be designated on either side of the lagoon, to protect the lagoon and its wildlife resources from human intrusion, sedimentation and the visual impacts associated with development, and to protect development from flood hazards. The buffer area would consist of the narrow strip of land between the lagoon and development to the north and a wider area between the lagoon and the bluff tops on the south and west. The northern buffer would remain free of structures, while the southern buffer strip would contain existing and expanded commercial and low-density residential uses, which would be sited and designed to control undesirable impacts on the lagoon. The remainder of the planning area, between the northern buffer strip and Via de la Valle, would be reserved for recreational uses associated with the racetrack/fairgrounds complex.

Design criteria and development controls to be applied to the buffer area were based on the following criteria:

1. preservation of the natural habitat values of the reserve;
2. protection of the water quality of the reserve;
3. preservation of the visual resource values of the lagoon and its viewshed; and
4. protection of the scenic bluffs.

Environmental Assessment of the program

This Lagoon Enhancement Plan was found on November 19, 1979 by the City of Del Mar City Council to be categorically exempt from the requirements of the California Environmental Quality Act (CEQA). Specifically, Section 15107 of the California Administrative Code states that a Class 7 exemption covers "actions taken by regulatory agencies as authorized by State Law or local ordinances to assure the maintenance, restoration or enhancement of a natural resource where the regulatory process involves procedures for protection of the environment... Construction activities are not included in the exemption". With the City of Del Mar acting as the "regulatory agency", and the project designed to conform to the California Coastal Act and the Coastal Conservancy Act, this plan accomplishes the goals of the California Environmental Quality Act.

To evaluate future construction activity, a "focused EIR" will be prepared by the lead agency on the environmental impacts of such activities. However, preliminary environmental assessments have been included throughout the preparation of this program in order to ensure their consideration in the planning process.

Additional information on impacts is found at page 1-7. The actions proposed to implement this plan are listed in Appendix B with assessments of significant impacts.



chapter one

san dieguito lagoon program introduction

program background

The San Dieguito Lagoon Enhancement Program is a joint effort of the State Coastal Conservancy and the City of Del Mar to restore and enhance a degraded wetland on the San Diego coast. This program is a "resource enhancement plan" as established in the Conservancy's enabling act and is a component of the Local Coastal Program (LCP) prepared by the City of Del Mar in accordance with the California Coastal Act of 1976.

The history of this program goes back to 1974 when the California Department of Fish and Game and the Federal Bureau of Sport Fisheries and Wildlife (now the Fish and Wildlife Service) published a report recommending San Dieguito Lagoon and 18 other coastal wetlands for top-priority acquisition in California. The Department of Fish and Game (DFG) in 1976 issued a more detailed study which recommended the lagoon be established as an ecological reserve and with the restoration of tidal actions to create a marine environment. In 1975 the California Coastal Zone Conservation Commission completed the California Coastal Plan which designated the lagoon as a special study area.

In 1974 the City of Del Mar appointed a citizens' Lagoon Preservation Committee to prepare a specific plan for the lagoon which was reported to the City Council in April 1975. In the following year, the California Coastal Act was passed, requiring local governments to prepare LCPs for those portions of their jurisdictions within a designated coastal zone. To begin this process the City contracted with the Coastal Design Group at California State Polytechnic University, Pomona, to develop a series of conceptual design alternatives for the enhancement of the lagoon. The citizens' committee served as advisors for this study. The "preferred alternative" which resulted from this effort was endorsed by the City and became the starting point for the preparation of this program.

Many of the citizens on the 1974 committee were re-appointed to the Lagoon Planning Committee in 1978 as preparation of the City's LCP was begun. The new group was expanded to include property owners and others to ensure balanced input.

In the fall of 1978 the City found that it had insufficient funds to complete a thorough study of the lagoon and requested assistance from the State Coastal Conservancy.

A planning grant of \$30,000 was awarded in November 1978 by the Conservancy which, with an LCP-related grant of \$8,000 from the Coastal Commission, enabled City and Conservancy staff to begin the consultant selection process. In April 1979 Sea Science Services, Inc. was selected as the primary consultant for engineering and hydrological studies, with Pacific Southwest Biological Services, Inc., providing biological and impact assessment. Throughout the following months of research the citizens' committee, the Department of Fish and Game, the U.S. Fish and Wildlife Service (USFWS), as well as numerous representatives of local agencies, contributed outstanding technical advice and many hours in meeting participation.

The result of this long planning process is the present program which is based upon the preceding work by DFG and Cal Poly planners, but which presents in much greater detail the methodology necessary to make the project an implemented reality.

This document has three major components: Chapter Three, the lagoon enhancement plan, identifies appropriate site alterations to enhance the area's environmental quality. Provisions for recreational access and vehicle circulation are also made.

The implementation plan in Chapter Four describes appropriate means for carrying out the desired site improvements, recommends areas for acquisition, outlines management responsibilities, and proposes appropriate funding sources for each phase of the enhancement program. The lagoon land use regulations establish the zoning and other ordinance control necessary to protect the integrity of the lagoon as part of the City's LCP in Chapter Five.

These chapters have been based upon a substantial physical inventory of the lagoon's natural and human-made resources which are summarized in Chapter Two. In addition a substantial amount of supporting technical material is included in appendices and the consultants' report which can be reviewed at the Del Mar Planning Department and the Conservancy office.

The program is based upon the premise that the regulatory measures of Chapter Five will adequately protect the lagoon from inappropriate uses. As land acquisition funds become available, and necessary approvals are obtained, the enhancement work may begin.

program significance



Coastal marshes and estuaries are among the most productive and valuable ecological systems in California. In their natural condition they produce large quantities of food for both marine and terrestrial organisms along the coast and provide essential habitat for hundreds of fish and wildlife species. Marine fish enter coastal wetlands to feed and also use them as breeding and nursery grounds. According to the Council on Environmental Quality (1978) about one-half of the commercial fish and shellfish harvest on the Pacific coast is dependent on coastal wetlands. The primary wildlife groups dependent on California coastal wetlands are a large variety of migratory shorebirds and waterfowl, which spend the winter or stop for shorter periods in these areas during annual migration along the Pacific flyway. Several million waterfowl frequent California's coastal wetlands annually. In addition, many species of wading birds, other water-associated birds, and raptors (birds of prey) are supported by coastal wetlands. Five endangered bird and mammal species are totally dependent on these areas. (see "endangered species" in Glossary).

San Dieguito Lagoon is one of the few wetlands remaining on the Southern California coast, an area which has lost 75 percent of its valuable wetland acreage since the time of European settlement and which continues to be subject to intense pressures for development. San Dieguito Lagoon itself has been reduced from 600 to 200 wetland acres, and suffers from a history of sewage discharges, water diversions, sedimentation, human and pet intrusion and other disturbances. In spite of the degradation of its habitat values, the lagoon remains a highly significant wildlife area which has been identified by the California Department of Fish and Game and the U.S. Fish and Wildlife Service as one of the 19 coastal wetlands of top priority for acquisition.

The lagoon's ecological significance and restoration potential have also been recognized by the California Coastal Commission and the Cities of San Diego and Del Mar. San Dieguito provides the opportunity to balance, within the context of the 1976 California Coastal Act, a complex array of demands: for protection and enhancement of the lagoon's biological productivity, species and habitat diversity, and aesthetic quality; for elimination of health hazards and flood hazards; for provision of

recreational and educational opportunities; and provision for urban land uses.

This program also can serve as a model for other wetland enhancement efforts along the California coast. The preparation of this document has required the creation of new concepts and methodology for which no proven or documented precedents exist. Therefore, much of this program is experimental. As a result, a phased implementation process was developed (Chapter Four) to permit monitoring of results and further plan refinement as increasingly difficult levels of work are initiated. This program, then, is also a means to increase the understanding and state-of-the-art of lagoon and wetlands management in California and can become a vehicle which leads to a higher level of activity by State and Federal agencies in the preservation and enhancement of our invaluable wetland resources.

Objectives

From the existing lagoon documents (by Cal Poly and DFG) and the early research for this program, a set of policy objectives evolved to guide the definition of enhancement actions for the lagoon. The overall goal of this program is to meet the intent of Section 31008 of the Public Resources code, which describes a "Coastal Resource Enhancement Project" as being "actions taken by a local public agency or a state agency necessary to restore, as nearly as possible, degraded natural areas to their original condition or to enhance the resource values of the coastal zone." This activity must of course also be conducted in a manner compatible with the Coastal Act of 1976.

The program objectives which have guided the development of the lagoon enhancement actions are as follows:

- Establish appropriate land use, structural design, and erosion controls in and around the lagoon.
- Secure public ownership or control of lands in the lagoon;
- Protect the existing environmental value of the lagoon;
- Enhance water circulation and tidal flushing in the lagoon;
- Improve or create a variety of habitats to increase wildlife diversity and ensure protection of endangered species;
- Facilitate recreational access, vehicle circulation, educational and scientific activities and any coastal/water dependent uses which do not significantly diminish resource values;
- Identify funding and management mechanisms to achieve the cost-effective and timely completion of site development work;
- Conduct adequate scientific monitoring of the resources and policing of human activities to protect the lagoon from adverse impacts.

Environmental Impact assessment

On November 19, 1979, the Del Mar City Council found this plan to be categorically exempt from the administrative requirements of the California Environmental Quality Act (CEQA). Specifically, Section 15107 of the California Administrative Code states that a Class 7 exemption covers "actions taken by regulatory agencies as authorized by State law or local ordinances to assure the maintenance, restoration or enhancement of a natural resource where the regulatory process involves procedures for protection of the environment..." Construction activities are not included in the exemption.

With the City of Del Mar acting as the "regulatory agency", and the project designed to conform to the California Coastal Act and the Coastal Conservancy Act, this plan is consistent with the goals of the California Environmental Quality Act.

In terms of future construction activity a "focused EIR" (see glossary) will be prepared by the lead agency on the specific environmental impacts of such activities. This document can become the base of a "master environmental assessment" for the lagoon.

Preliminary environmental assessments have been conducted throughout the preparation of this plan in order to ensure consideration of impacts during the planning process. These assessments are noted in Appendix B and are summarized below.

SIGNIFICANT ADVERSE IMPACTS

As proposed, certain aspects of the construction of the channels and tidal basins will result in significant adverse environmental effects which cannot be avoided, but can be mitigated if the project is implemented. No impacts are considered irreversible.

As the result of these activities, there will be a temporary loss of some of the existing pickleweed. Further, soil excavations in or near a waterway will result in sedimentation. This work will also disturb benthic (bottom-living) organisms. Some of the excavation work will require the construction of temporary roads to permit truck and dragline access. The use of suction dredgers could create serious problems of excessive soils removal (to permit boat movement), and storage and disposal of the spoils.

MITIGATION AND BENEFITS

The short-term adverse effects of excavation work in the lagoon should be offset by the overall long-term effect of the project, which is to increase the biological productivity and diversity of the lagoon. The increased tidal flushing and water circulation will improve water quality, reduce mosquito breeding and enhance the lagoon's scenic quality.

The short-term loss of pickleweed will be offset by the revitalization of the remaining pickleweed and the establishment of new salt marsh. Pickleweed is known to recover quickly and can be expected to colonize the new areas suitable for marsh within a few years.

Sedimentation and bottom disturbances will be held to a minimum to accomplish the program design. The use of heavy dredgers will be avoided in all phases but the last. It is anticipated that excavated soils will be transported directly to the racetrack/fairgrounds for use there. Excavation work must be preceded by a EIR/EIS which will address in detail the issues of sedimentation, bottom disturbances, impacts of access roads and spoils disposal.

ALTERNATIVES

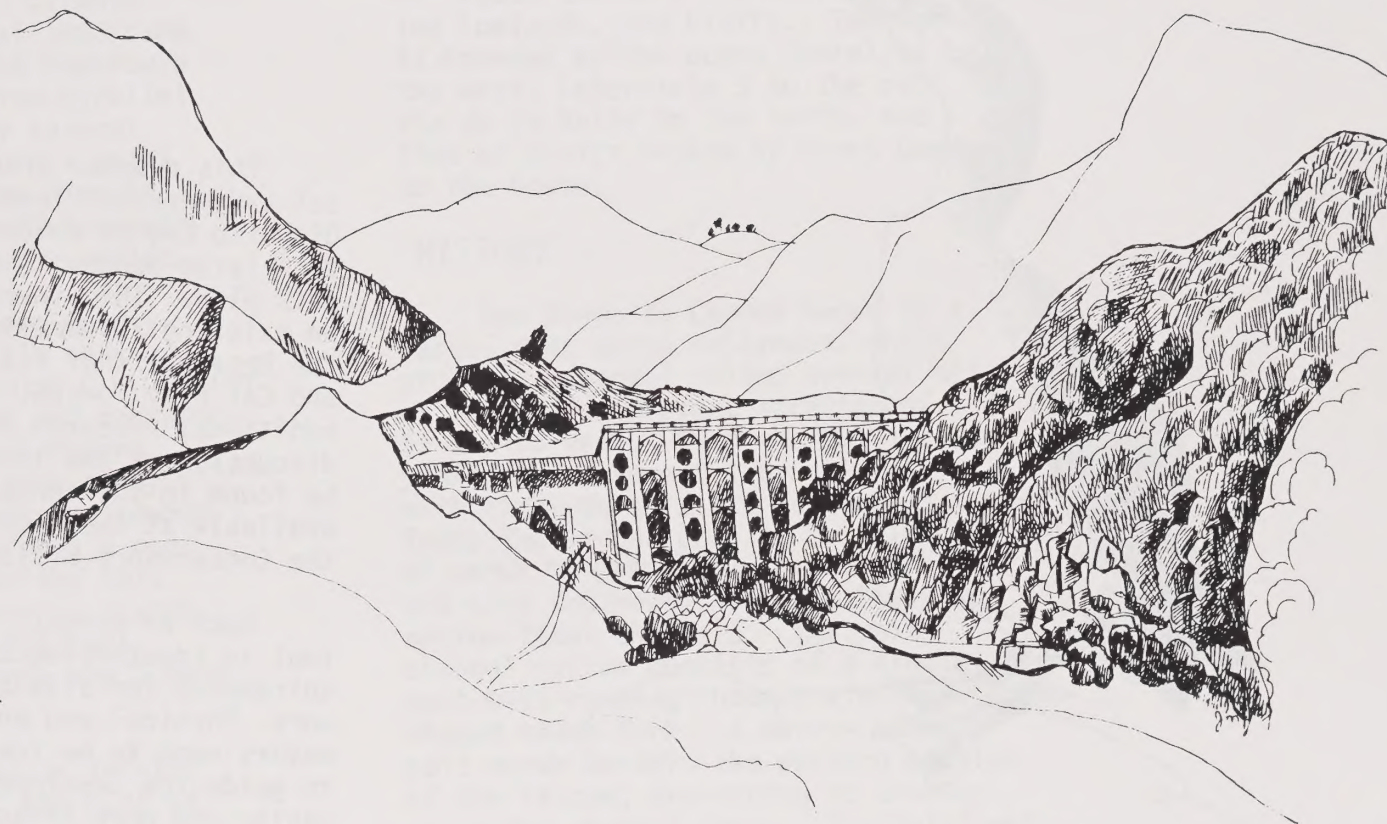
If there is no project, the lagoon, as is, would continue to have resource values but its productivity would not be achieved and deterioration will continue. Management and monitoring would be nearly non-existent. For all phases where earth movement is needed, a conceptual design has been proposed, as has the equipment which seems most suited to the work.

The entire project has, in effect, a built-in mitigation process which results from the phasing of the six major construction activities. A primary reason for de-

signing the work in sequential stages is to permit full evaluation of each activity to occur before and after it is accomplished. Any adverse consequences can and must be resolved before the next phase begins. In addition, this prudent approach to implementation offers flexibility in later refining the design concepts as new information on methodology becomes available.

Alternatives to those planning guidelines can be identified as the phase is initiated, under the following process: The lead agency will solicit bids based on the policies and intent of this plan. The responding engineering firms will submit their proposals for the work which may include revisions for scope of excavation and equipment to be used, etc. The lead agency will select the most appropriate response but, before initiating the contract, will prepare and circulate a focused EIR describing the engineers proposal and its relationship to this Lagoon Plan. The EIR review and comment process will then clarify how the contract and the work are to be executed.

Hence, the phasing process permits the identification alternatives and modifications, which reflect current economics and the state-of-the-art in wetland management.



chapter two

san dieguito lagoon existing environment

Introduction



This chapter presents an ecological and physical inventory of the San Dieguito Lagoon which has been prepared to a large degree specifically for this plan. This inventory was based on existing information prepared by the Department of Fish and Game (DFG) and Cal Poly Pomona, supplemented by additional research. A detailed discussion of the inventory data can be found in the consultants' report, available at the City of Del Mar and the Conservancy office.

Such an inventory is a vital tool in identifying the design requirements for site construction work. Physical and environmental parameters need to be identified in order to guide the development of project design and work tasks. This process satisfies a major intent of the California Environmental Quality Act, i.e., the avoidance of adverse impacts through adequate planning, data collection and mitigation as required.

the lagoon setting

LOCATION

The San Diego coast region is characterized by a mild ("sub-tropical Mediterranean") climate and an attractive coastal landscape. The broad terraces of the Peninsula Mountain system, which run parallel to the coast, are cut by several rivers, most of which form a small lagoon at the mouth. San Dieguito Lagoon is one of the smaller remaining coastal wetlands in the region.

Most of the San Diego County wetlands have been greatly reduced in size and have poor water circulation partially due to filling and construction of transportation corridors. Water quality has been reduced by continued use of wetlands for sewage effluent disposal. There is a conspicuous shortage of healthy salt marshes containing extensive stands of cordgrass (Spartina foliosa) and pickleweed (Salicornia spp.) vegetation in the region.

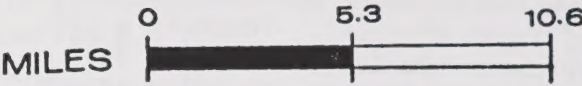
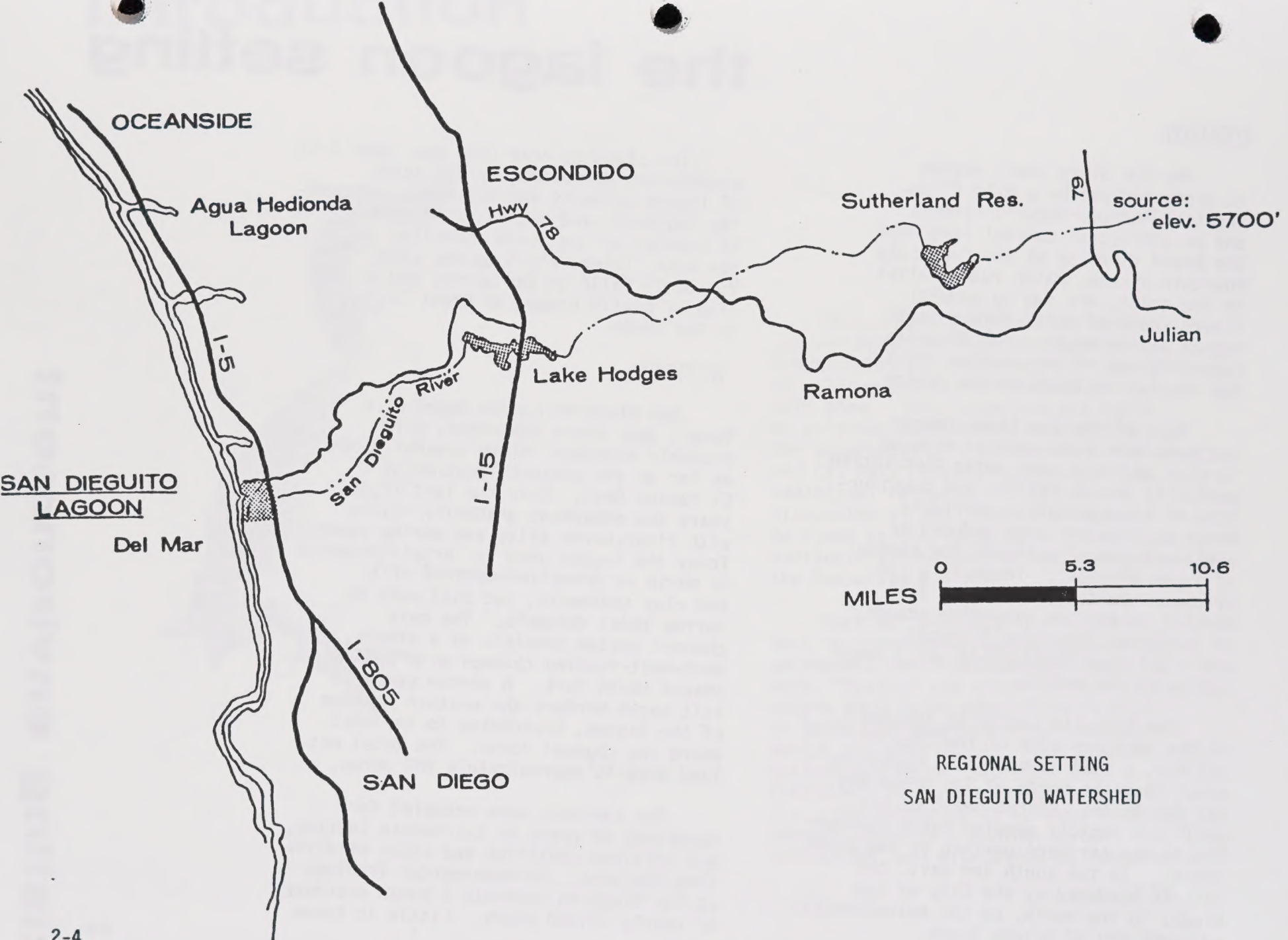
San Dieguito Lagoon is located on the northern edge of the City of Del Mar, a small residential community about 20 miles north of San Diego Bay. Del Mar is the southernmost of six small but rapidly growing beach communities in the northern portion of San Diego County. To the south and east, the City is bordered by the City of San Diego; to the north, by the unincorporated community of Solana Beach.

The planning area (see map, page 2-6) encompasses approximately 650 acres of lagoon channels and wetlands, surrounding lowlands, and bluffs. The area is bounded by the ocean shoreline to the west, Interstate 5 to the east, Via de la Valle to the north, and a line of bluffs broken by Crest Canyon to the south.

HISTORY

San Dieguito Lagoon began as a large, deep ocean embayment, which probably extended inland several miles as far as the present location of El Camino Real. Over the last 12,000 years the embayment gradually filled with river-borne silts and marine sands. Today the lagoon area is largely composed of marsh or grassland-covered silt and clay sediments, cut shallowly by narrow tidal channels. The main channel system consists of a single, east-west-running channel with a fishhook-shaped south fork. A narrow strip of salt marsh borders the western portion of the lagoon, broadening to the east where the channel forks. The total wetland area is approximately 200 acres.

The environs were occupied for thousands of years by California Indians, who utilized shellfish and other wildlife from the area. Archaeological findings at San Dieguito indicate a human occupancy of nearly 50,000 years. Little is known



REGIONAL SETTING
SAN DIEGUITO WATERSHED

about the condition of the lagoon at the time of Spanish settlement, but some early accounts describe the area as very green, with flowing streams or ponds of water, indicating that more fresh water once flowed into the lagoon.

At the turn of this century, the lagoon consisted of a 600-acre expanse of salt marsh, tidal channels, and freshwater-brackish marsh extending nearly two miles inland. The San Dieguito River was reported as one of only three streams in the area (the others being the Santa Margarita and the Soledad) which were able to keep narrow channels open year-round through sand deposits at the river mouth.

The lagoon has undergone many changes in the last eighty years. The completion of Lake Hodges and Lake Sutherland dams reduced the effective drainage basin of the lagoon from 345 to 43 square miles, reducing aquifer recharge and freshwater habitat in the lower valley and eliminating the periodic river floods that had previously helped to keep the lagoon channels free of silt and the lagoon mouth open to tidal exchange.

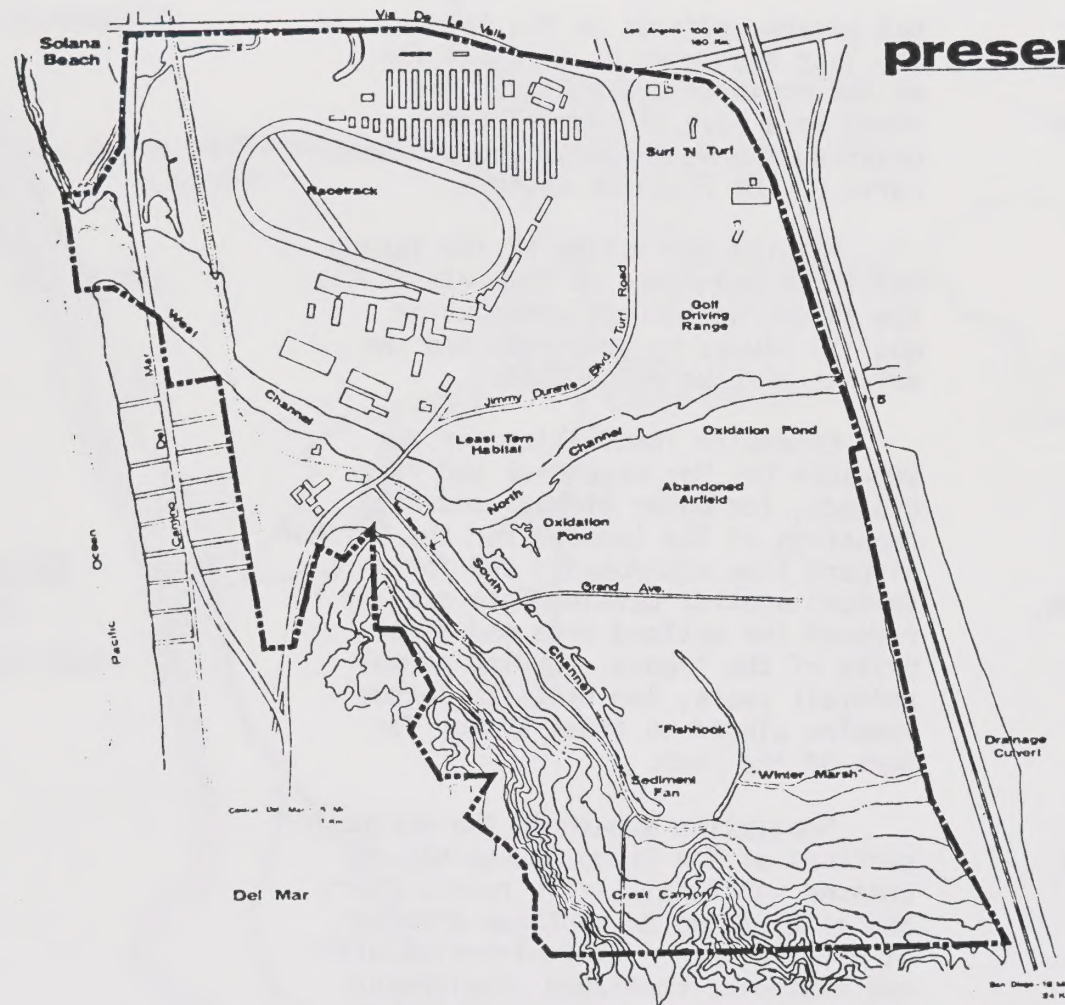
Water quality problems in the closed lagoon were aggravated for many years by discharges of sewage effluent into two oxidation ponds in the eastern portion of the lagoon, a practice which was discontinued in 1975. Sedimentation from the disturbed watershed has also

had adverse effects on the lagoon. In the last two years an alluvial fan at the mouth of Crest Canyon has grown to a size of several acres, covering the wetlands in the southern curve of the Fishhook channel.

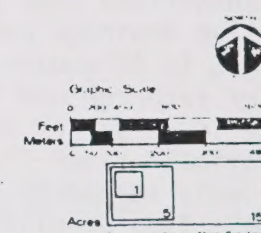
Farming activities at the lagoon had to be abandoned in the late 1930's due to degradation of groundwater quality caused by overdraft and the effects of Lake Hodges Dam.

Extensive landfilling for the 200-acre Del Mar racetrack and fairgrounds, for major highway and rail crossings of the lagoon, for the Del Mar Airport (now abandoned), and for various smaller developments greatly reduced the wetland area and tidal prism of the lagoon. During normal rainfall years, San Dieguito lagoon remains closed to tidal action for much of the year.

Population growth in the northern portions of San Diego County has increased substantially in recent years and is expected to continue growing at a rapid rate. If implemented without controls, continued development in the watershed will contribute to sedimentation and pollution in the lagoon.



present environment



san dieguito lagoon enhancement plan

City of Del Mar, California • State Coastal Conservancy

natural resources

Habitat Types

The major habitat types in the San Dieguito Lagoon study area are: open water, mudflats, coastal salt marsh, freshwater-brackish marsh, salt flats, maritime sage scrub, disturbed upland vegetation, sand dunes, and sterile ground (parking lots and other barren areas).

Open water having a depth of over 6 inches at high tide covers about 38 acres, or approximately 14% of the total lagoon area at present. This habitat is used by aquatic invertebrates, fish, aquatic snakes, turtles and several bird species. Some larger wading birds feed in the shallower parts of this habitat. This area, useful as an escape area for birds, includes steep and gently sloping shores.

Shoreline mudflat areas, which are covered with shallow water (0-6 inches in depth) at high tide but exposed at low tide, cover approximately 3 acres, or 1% of the total lagoon area. At high tide, this habitat is used extensively by smaller fish or fry, aquatic invertebrates, aquatic snakes, and a variety of birds, including ducks, waders, and shorebirds. Invertebrates (e.g. worms, clams, and crabs) experience heavy predation at low tide from birds and at high tide from fishes. This habitat is very important to shorebirds for feeding and resting and to many other types of birds as a resting area.

Belding's Savannah Sparrows also forage in this habitat. Low elevations could harbor eelgrass (Zostera) or cordgrass (Spartina foliosa), neither of which is now found in the lagoon.

Marsh habitats (excluding salt flats) cover approximately 18% of the lagoon area (about 49 acres). Two major types of marsh occur at the lagoon: coastal salt marsh and freshwater-brackish marsh. Coastal salt marsh occupies the bulk of the undisturbed portion of the lagoon and is the focus of the enhancement plan.

The salt marsh as mapped is mostly Pickleweed (Salicornia virginica), Alkali Heath (Frankenia grandifolia) and Shoregrass (Monanthochloe littoralis). The vegetation represented by these plants is characterized here as a closed-lagoon "low marsh".

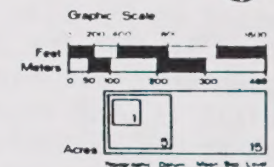
Although this association is typical of coastal salt marsh habitats in Southern California, several expected species are lacking or have yet to be detected in the San Dieguito Lagoon system. These plants include Spartina foliosa, Batis maritima, Salicornia bigelovii and Cordylanthus maritimus. All of these plants are found in salt marshes north and south of the San Dieguito lagoon, so geographical range limitations do not explain their absence from the lagoon.



vegetation / habitats (Existing)

Legend

-  Open Water
-  Salt Marsh
-  Fresh Water Marsh
-  Phragmites
-  Juncus
-  Mudflats
-  Salt Flats
-  Disturbed Grassland
-  Disturbed Area
-  Escaped Exotics
-  Sterile
-  Coastal Dune
-  Sand Delta
-  Inland Sage Scrub



san dieguito lagoon enhancement plan

City of Del Mar, California • State Coastal Conservancy

It is presumed that the high degree of disturbance in the lagoon accounts for this lack of certain wetland plants, but the precise cause-and-effect linkage is unclear.

Marsh vegetation dominated by Salicornia harbors Belding's Savannah sparrows, song sparrows, and a few nesting ducks but is otherwise of limited value to most avian species. Raptors hunt over this area where a number of insects and small mammals can be found. Channel banks at the edge of this habitat are often quite steep and may allow rapid escape into the water by waterfowl surprised by predators.

Decomposition products from Salicornia and associated vegetation when flushed into the lagoon channels provide nutrients for invertebrates and some fish.

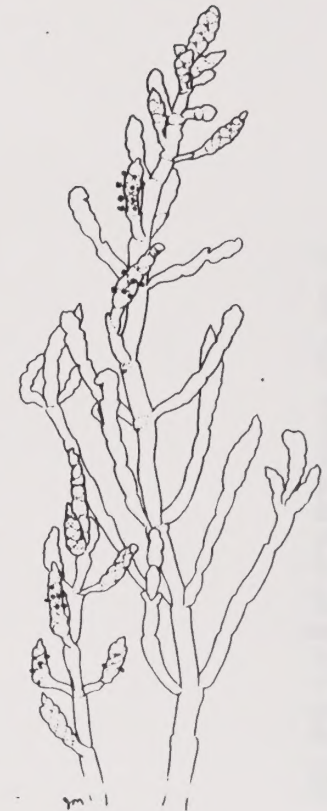
In some areas marsh vegetation is mixed with grasses and salt flats, lowering the quality of habitat for marsh species.

Freshwater-brackish marsh, mapped as Freshwater Marsh, Phragmites, or Juncus, occurs at several sites in the study area. Cattails (Typha latifolia) dominate a low area along the San Dieguito River, under the Interstate 5 bridge. West of the railroad tracks, leakage from a water main sustains an interesting assemblage of aquatic and marsh plants, dominated by the sedge, Cyperus laevigatus. Freshwater marsh

vegetation also occurs on the south side of the channel west of the Jimmy Durante Bridge; the source of fresh water for this stand is unknown.

The low-lying area east of the Fish-hook channel is periodically flooded with freshwater runoff during the winter. The deposition of the Crest Canyon alluvial fan has impeded drainage of the area, resulting in longer periods of ponding. This shallow water area is utilized by a variety of birds, including dabbler ducks, shorebirds and other species.

Salt flats, or closed-lagoon "high marsh", comprise approximately 6% (16 acres) of the total lagoon area. Most of the high marsh occurs south of Grand Avenue, in the eastern portion of the lagoon. This habitat is a mixture of open salt flats and clumps of Glasswort (Salicornia subterminalis). Portions of the high marsh have been invaded by non-native grasses, particularly Hordeum. Killdeer and ducks are occasionally seen in these open areas but probably derive very little nutritional or other value from them. Since the salt flats are not extensive and are generally interspersed with vegetation, they provide only limited isolation from surrounding vegetated areas which may harbor predators. In other lagoons exhibiting expansive flats, terns and shorebirds may rest in the protection of this open terrain.



Upland vegetation comprises approximately 50% (135 acres) of the total lagoon area. Two habitat types are included in this general category: disturbed, mostly non-native vegetation (mapped as Disturbed Grassland, Disturbed Area, or Escaped Exotics), and native maritime sage scrub. Disturbed areas of the lagoon are mostly in the eastern portion of the study area, where previous light industry, land filling, and an oxidation pond for sewage treatment are or were located. Due to previous human activity, undisturbed native sage scrub vegetation occurs only near the southeast boundary of the lagoon.

Numerous species of upland birds, mammals, reptiles and amphibians utilize both disturbed and native upland habitats extensively. The scrub vegetation in Crest Canyon and the small section of relatively undisturbed land east of the Canyon probably serve as refuges for a variety of animals (e.g. several larger mammals, snakes, and lizards) and as a source of animals that regularly move into the lagoon area.

Sand dunes comprise approximately 1% (3 acres) of the total lagoon area. Dune vegetation occurs on the south side of the San Dieguito River channel along Camino del Mar. The sector east of the highway has been disturbed significantly in the past but, because of recently stabilized soil, now appears to be recovering as Sage Scrub.

The sector west of the highway is in a more natural condition but foot traffic, littering and flotsam deposition during storms and high tides have degraded the area. Wind action is still adequate to maintain the dunes and with adequate foot traffic control the site will soon recover. Sea fig (Carpobrotus), ragweed (Ambrosia), and sand verbenas (Abronia), are taxa which characterize the vegetation of the dunes here.

Since the dunes at San Dieguito are limited in area and subject to considerable human impact, they are of limited value to wildlife. However, a variety of native plants occur in this area, and the Globose dune beetle, a rare species, is known to inhabit this kind of environment. In earlier times, when human disturbance was low, least terns nested in large numbers in such dune habitats.

Sterile ground (parking lots and other barren areas) occupies approximately 10% (27 acres) of the lagoon area. The major wildlife use of these areas is for resting by gulls, terns and occasionally a few other species. Kill-deers forage here and least terns have attempted to nest. During rainy periods, ponds form in depressions in these areas, and increased shorebird and puddle duck use occurs. Protection of these flat, open areas will likely increase numbers of least terns and shorebirds nesting in the lagoon.

Enhancement Needs and Constraints

It is apparent from the relative percentages of the major habitat types at San Dieguito Lagoon that mudflats, ponds, sand dunes and salt flats are in relatively short supply. In order to achieve greater habitat heterogeneity, which generally corresponds with greater animal species diversity, it appears desirable to increase the relative percentage of the rarer habitat types at the lagoon. Sand dune habitats are very difficult to create in the lagoon, and sizable salt flats are both difficult to create in such a small lagoon and are also of limited value to wildlife; therefore, mudflats and ponds are considered the most important of these habitat types to create as part of the lagoon enhancement program. Because the western portion of San Dieguito Lagoon has been restricted to a relatively narrow passageway by channelization and encroaching development, most of the desirable habitat expansion must occur in the eastern portion of the lagoon.

Flora

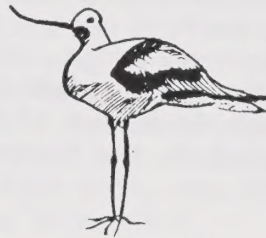
The flora of San Dieguito Lagoon is generally dominated by species that are adapted to the relatively high salinities and temperatures that frequently occur in the periodically hypersaline lagoons of Southern California and Northern Baja California. Past disturbance has left little of the original marsh, and the diversity of plant species usually found in such environments is very low. In fact, San Dieguito had the lowest species diversity of any of the San Diego County lagoons studied in the late 1930's. Although 99 plant taxa have been inventoried for the San Dieguito Lagoon by the present study, only 57% of the species are native component, only 16 taxa (28%) are associated with the coastal salt marsh habitat remaining in the lagoon.

Two sensitive plant species occur at San Dieguito Lagoon. A population of Prostrate Hosackia (Lotus nuttallianus) occurs in the dune habitat west of Camino del Mar. This species is considered rare and endangered by the California Native Plant Society (CNPS) due to habitat destruction and limited geographical range. About six plants occur in the population, and these could increase in number if the dune area is protected in the future.

Another sensitive plant species in the lagoon is the sea dahlia (Coreopsis maritima), an attractive herbaceous perennial sunflower which occurs on sea bluffs from Leucadia, California to San Quintin, Baja California. This species is rated as rare but not endangered by the CNPS though it is threatened by sea bluff development. Within the study area, only seven plants occur; these are found on the west side of the railway embankment and just west of the Crest Canyon sand delta.

Enhancement Needs

The relative paucity of native plant species at San Dieguito Lagoon indicates the extent to which the lagoon has been disturbed by trampling, landfilling, water pollution, loss of tidal flushing, and other development-related impacts. To enhance the health and diversity of the lagoon's vegetation, it is desirable to control these impacts, and in particular to improve tidal action in the lagoon, since this would allow cordgrass (Spartina foliosa) and other intertidal plant species beneficial to fish and wildlife to return to the lagoon. In addition to enhancing overall plant species diversity, it is desirable to protect the two rare species which now occur at the lagoon.



Fauna

BIRDS

A total of 118 bird species (both upland and water-associated birds) have been sighted at San Dieguito Lagoon. Several additional species are also likely to frequent the lagoon periodically. An example of the variety of birds that may utilize San Dieguito Lagoon during the year is provided by counts recorded for San Elijo Lagoon (three miles north). Over 190 species were recorded there during recent censuses beginning in 1973. A majority of these species are potential visitors or residents in San Dieguito Lagoon.

The birds considered to be of primary concern in San Dieguito Lagoon are listed with their major habitats and foods in the consultants' report. The habitat type most heavily used by birds at the lagoon is shallow water/mudflat, with several other habitat types having fairly equal secondary levels of use.

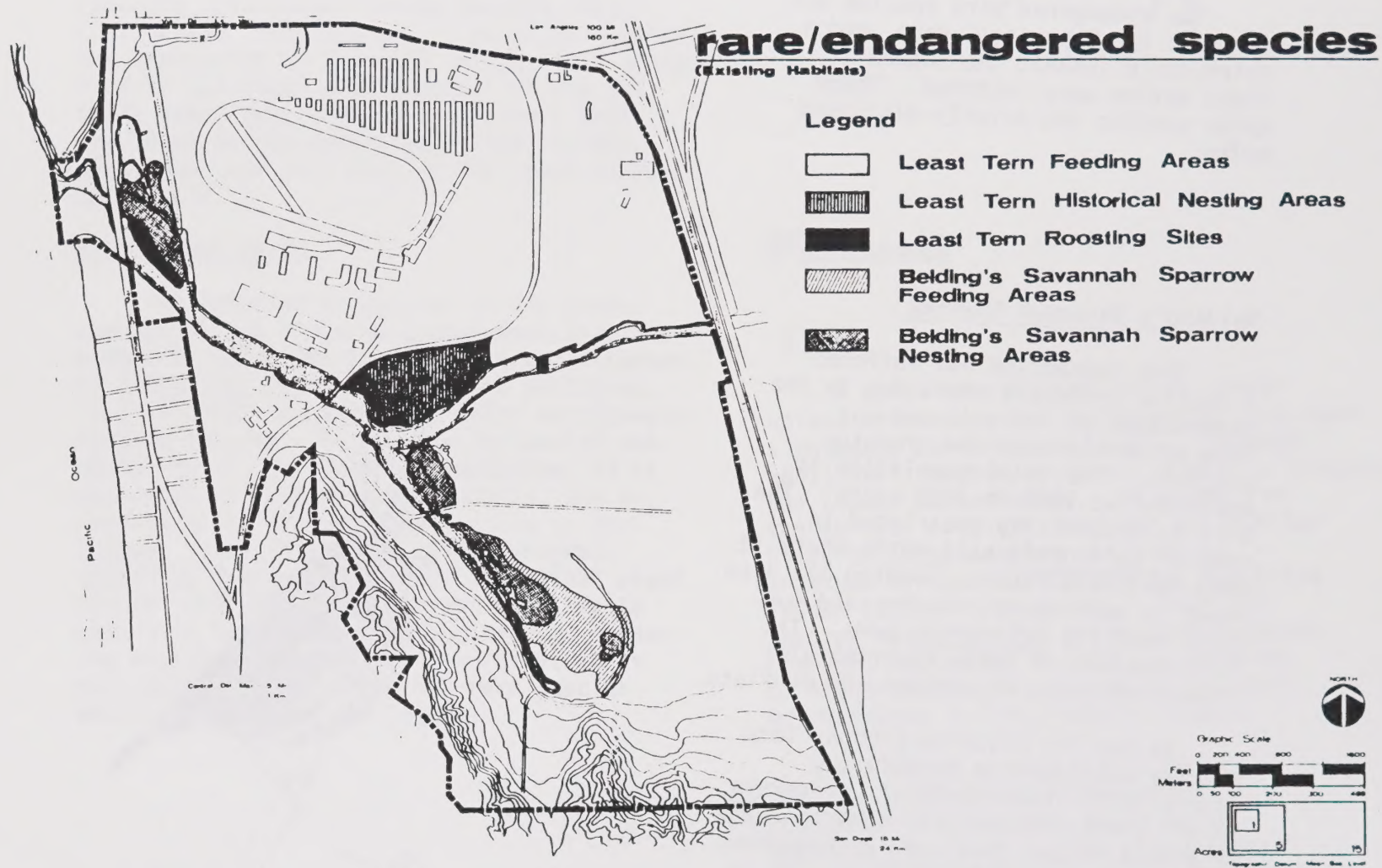
Two endangered bird species are found at San Dieguito Lagoon, and a third could inhabit the lagoon if tidal action were restored. These three species are briefly discussed below.

Belding's Savannah Sparrow

This subspecies has suffered a decline in recent years due to the destruction of its sole habitat type by development and dredging projects. The total population is estimated at 1000 to 1600 pairs. The bird is essentially restricted to coastal Salicornia salt marsh where it both nests and feeds. Feeding may also occur in sand dunes, beaches and mudflats near its Salicornia home. Its diet consists of small invertebrates inhabiting marsh vegetation and mudflats.

In the San Dieguito Lagoon, this species was found to inhabit the several available stands of Salicornia. In all areas, these birds seem to occur in groups rather than evenly throughout the existing suitable habitat. Due to the secretive habits of this bird, as well as the likely occurrence in the area of non-breeding birds, the population size may be somewhat underestimated. Expansion of Salicornia marsh should lead to an eventual increase in numbers of this species.





san dieguito lagoon enhancement plan

City of Del Mar, California • State Coastal Conservancy

California Least Tern

This species formerly occurred in large numbers in coastal California but latest estimates indicate a California population of approximately 780 pairs. Historically, nesting occurred in colonies on sandy beaches and mud or salt flats up and down the coast. Recent development of coastal lands, including the destruction of many acres of coastal wetlands, has drastically reduced the preferred nesting and resting habitat for this species, forcing it to nest in marginal areas. Its optimum nesting habitat is on sterile sand substrate, with low or non-existent levels of human and predator disturbance, near waters containing small fish for feeding. The nesting season extends from April 1 to August 15. Resting areas include dikes, mudflats or salt flats.

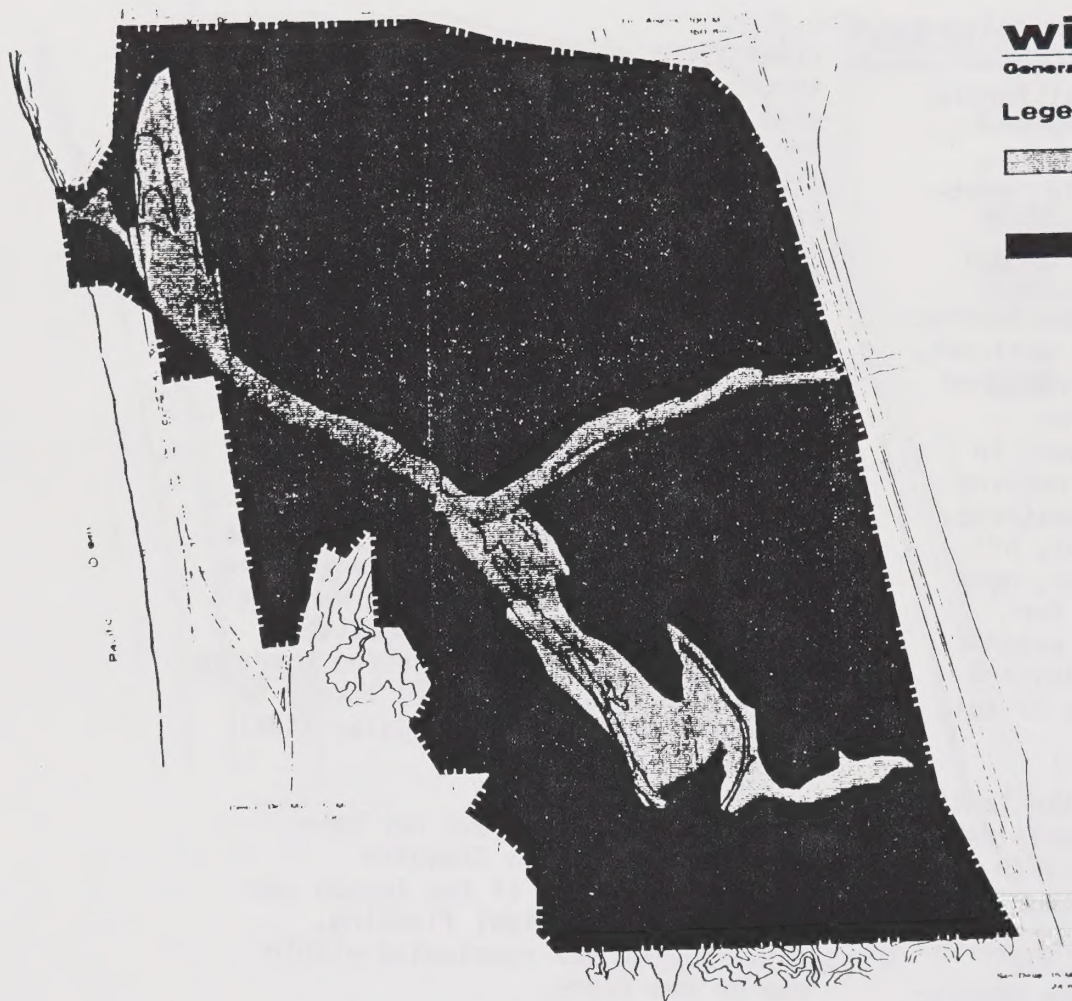
In San Dieguito Lagoon the least tern regularly feeds in channels and ponds. A nesting attempt in 1973 on the dirt parking lot was aborted due to disturbance by dogs. Large numbers (approximately 100) of these birds have since been observed resting on this lot in pre-migratory groups. Feeding of young by adult birds has occurred in the area just west of Interstate 5 before the 1977-78 and 1978-79 high

river flows eliminated the dike across the river and deepened the once shallow pond in that area. Thus, the least tern has historically frequented the San Dieguito Lagoon and is expected to increase its use, including nesting, as suitable habitats are developed.

Light-footed Clapper Rail

This species was once a common resident of California salt marshes. Destruction of its marsh habitat has been the major reason for its decline to a present estimated population low of 250 birds. Its preferred habitat consists of salt marsh vegetation containing both Salicornia and Spartina (cord grass) which is most likely to occur in areas open to regular tidal flushing.

Clapper rails have not been recorded in the San Dieguito Lagoon. However, if the lagoon can be kept open to tidal flushing, this species may recolonize within one or two years.

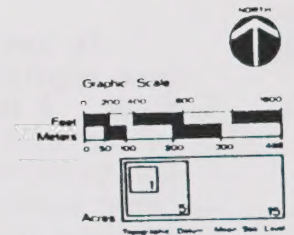


wildlife habitats

Generalized Existing

Legend

-  Aquatic Species, Waterfowl, Shorebirds
-  Upland Species
 - mammals
 - reptiles
 - raptors
 - passerine



san dieguito lagoon enhancement plan

City of Del Mar, California - State Coastal Conservancy

FISH

At least ten species of fish are known to inhabit San Dieguito Lagoon when the mouth is open. Mullet have been observed in the main river channel near Interstate 5 and large numbers of topsmelt use the lagoon, possibly for spawning. Mosquitofish have been observed only beneath and east of the Interstate 5 bridge when the river was flowing strongly.

Large schools of juvenile fish have been observed throughout the lagoon, particularly in shallow waters (one to six inches in depth). Calm, shallow waters, such as those found in San Dieguito Lagoon, are important areas for development of the young of many fishes, providing protection from larger fish predators and reducing energy required by the juvenile fish to maintain their position in the water. The high productivity of embayments also provides a high quality food source for growing fish, and injured fish may use lagoons and bays as recuperation areas.

Fish use San Dieguito Lagoon extensively at present when the lagoon is open and would likely increase their use of this wetland if tidal action were increased sufficiently to keep the lagoon mouth open most of the year. Although some fishes such as killifish and mullet can tolerate

the high salinities and extreme conditions prevailing in closed lagoons, most species require regular tidal flushing for their continued survival in lagoons.

REPTILES, AMPHIBIANS

Fifteen species were observed during the present study. There appears to be lower density and diversity in the lower lagoon area as opposed to the upper lagoon area, possibly because of the soil type (muddy in the lower area, looser and drier in the upper area) and vegetation structural diversity (primarily grass and weeds in the lower area, and shrubs, grasses, weeds and sub-trees in the upper area).

INVERTEBRATES

Eighty-seven species of aquatic invertebrates are recorded in San Dieguito Lagoon. Many of these species are characteristic of an unstable water system tending to rely primarily on recruitment from the sea to maintain their populations, rather than on reproduction within the lagoon itself. With time and a continually open lagoon entrance, species diversity and density should increase, whereas species dominance should decrease, leading to a more stable community composition.

Aquatic invertebrates form a very important link in the lagoon food web. These organisms filter large amounts of living and dead organic matter from the water, as well as feed on organic debris in the bottom mud. Small invertebrates are fed upon by larger invertebrates, which are in turn consumed by fish and birds. Thus, the diversity and productivity of the invertebrate fauna is important in the functioning of the lagoon aquatic ecosystem.

Insects are an important food source for amphibians, reptiles, fishes and birds. Although their ultimate impact on the lagoon ecosystem is unknown, it is potentially high. The San Dieguito Lagoon area may exhibit a considerable number of species due to its association with upland habitats.

Two rare insect species are potential inhabitants of San Dieguito Lagoon, as discussed below.

The Wandering Skipper (Panoquina panoquinoides errans) is a small butterfly which has been considered for inclusion on the federal Endangered Species List. It inhabits a narrow coastal strip from Santa Barbara to San Diego (and probably into Baja California). It is known to feed on salt grass (Distichlis spicata), a common salt marsh grass, and is therefore a potential inhabitant of San Dieguito Lagoon.

The Globose dune beetle was formerly common in low beach foredunes along the Pacific Coast, from central California to Baja California. Localities of occurrence are now scarce and population numbers low. As with other endangered coastal species, habitat destruction has been the primary cause of decline. In San Dieguito Lagoon it has not been seen but would be expected in the coastal sand dune habitat.

MAMMALS

A total of 21 mammal species have been recorded at the San Dieguito Lagoon in different investigations. In the present study small mammal trapping failed to reveal distinct patterns in species distribution, although two mouse species, Reithrodontomys megalotis and Mus musculus appeared to be the primary species utilizing Salicornia high marsh vegetation.



Enhancement Needs and Constraints

In spite of its degraded condition, San Dieguito Lagoon still manages to support an impressive variety of birds, including two endangered species. Among the Lagoon's animal groups, however, the water-associated birds are especially conspicuous and especially sensitive to human disturbance, and for these reasons deserve special consideration in the Lagoon Enhancement Program. Habitats of particular importance to water associated birds are mud flats and open water. In particular, it is desirable to expand nesting and feeding habitats for the two endangered bird species, the least tern and Belding's Savannah sparrow, and to protect them from human and animal disturbance. Diversity and abundance of mammals, reptiles, and amphibians are relatively low, reflecting the disturbed condition of the lagoon's upland habitat and the relative scarcity of freshwater marsh and pond habitat in the area.

Diversity and abundance of fish and aquatic invertebrates appear to vary with the degree of tidal flushing in the lagoon, increasing when the lagoon mouth remains open for several months and decreasing when the mouth closes. Improved tidal action in the lagoon would enhance habitat not only for these aquatic

fauna, but for the water-associated birds (e.g. the endangered Clapper rail) and other wildlife that feed on aquatic fauna or use intertidal habitat for resting or reproduction.

Three features of the geology of San Dieguito Lagoon are important to consider in planning for the Lagoon. First is the instability of the deep alluvium on the valley floor. Given its unconsolidated structure and the presence of ground water, this formation may be susceptible to liquefaction during a high magnitude earthquake; thus it is highly unsuited for major man-made structures.

The second feature is the high erodibility of Stream Terrace, Bay Point and older sedimentary deposits. These formations, generally exposed on steep slopes, pose a severe actual and potential sedimentation threat to the Lagoon. This is particularly evident on the bluffs at the mouth of the lagoon where human activities are greatly increasing erosion rates. Also, the existing and proposed development on these same erodible formations near El Camino Real increases the sedimentation problem in the lagoon.

Finally, the geological formations in the lagoon area are of great visual significance. Their steep, eroded forms with highly contrasting strata colors, give the lagoon area a unique stamp of identity, adding significantly to San Dieguito Lagoon's natural resource value.

The soils in the San Dieguito watershed have been classified by the Soil Conservation Service into six associations. In general, these soil associations have the common attribute of being easily eroded by water. This attribute, coupled with potential development actions, poses the threat of excessive sedimentation into the lagoon (witness the Crest Canyon alluvial fan). If San Dieguito Lagoon is to be protected from further sedimentation, unusually sensitive planning and design of development in the drainage basin will be required.

Suitability for Agriculture

The Prime Agricultural Lands Report (October 1974, Governor's Office of Planning and Research) identified certain lands within the lagoon planning area as prime agricultural lands, based on the Soil Conservation Service's system of rating the agricultural suitability ("farmability") of soils. However, the current investigation tends to contradict the OPR report's designation of prime agricultural land in the area.

The Soil Conservation Service's system ranks each soil type into one of eight Capability Classes, defined by the severity of the limitations on agricultural use. Class I soils have "few" limitations and Class II soils have "moderate" limitations. Classes III & IV have "severe" or "very severe".

limitations which restrict the choice of plants, require special management practices or both. Classes V, VI, VII and VIII are rated as having such severe limitations that they are generally only used for range, woodland, wildlife habitat, water supply, or aesthetic purposes. To receive a "prime" rating a given soil unit needs to meet the criteria for either Class I or Class II.

The prime land identified by OPR includes the overflow parking area north of the river which was identified in this investigation as sterile ground, barren of vegetation. It also includes the salt flat and marsh area surrounding the Fishhook, as well as the steep slopes (some over a 25% slope) south of San Dieguito Drive. The soils in this area are generally too saline to support crop production, but provide valuable habitat for the least tern and Belding's Savannah Sparrow as well as other water birds and song birds.

Furthermore, soils in the lagoon study area do not qualify as prime according to a second rating system, the Storie Index. This index gives soils a numerical rating, from 0 to 100, based on four factors: soil profile (root penetration potential), texture of surface soil, slope, and other conditions (such as acidity or alkalinity). The Williamson Act (the State's agricultural preservation law) defines a rating of 80 or more as the standard for designating a soil as prime according to the

Storie Index. None of the soils at San Dieguito Lagoon have index values above 79.

Hydrology

The natural drainage basin of San Dieguito Lagoon extends inland to the Cuyamaca Range, to an elevation of over 5700 feet, and covers an area of 345 square miles (see map, page 2-4). The mean seasonal rainfall in this basin varies from a minimum of 10 inches along the coast to 32 inches in the mountains. Runoff in the watershed is now largely controlled by the Lake Hodges and Lake Sutherland dams.

Prior to the completion of Lake Sutherland in 1954, water in Lake Hodges used to overflow the dam periodically. However, water has rarely topped it in recent years; hence, the effective drainage basin is the 43-square-mile watershed downstream from Lake Hodges.

Three major tributaries drain the watershed below the lake: Gonzales Creek, an intermittent stream on the southern border of the flood plain, east of Interstate 5; La Zanja Creek, which originates along with Gonzales Creek on the undeveloped hilly terrace between Carmel Valley and the San Dieguito Valley; and Lusardi Creek, which originates inland near the rapidly developing community of Rancho Bernardo. Two smaller water courses drain into the central lagoon basin from Crest Canyon on the south and Stevens Creek on the north.

The reduced streamflows to the lagoon and the extensive landfilling of lagoon wetlands have greatly reduced the lagoon's water area and tidal prism over the last 80 years. The present lagoon channel system is shallow, with an average water depth of about two feet, and covers less than 30 acres. The total sub-tidal and intertidal area of the lagoon is only 38 acres. Due to the limited tidal prism and reduced run-off, the entrance to the lagoon is often blocked by a broad sand bar, resulting in elimination of tidal influence. This causes a characteristic pattern of high lagoon salinities in the dry (summer) season and low salinities in the wet (winter) season. Some portions of the lagoon dry up completely during the summer.

This pattern of changing salinity and water surface area was stabilized for a time by the addition of sewage effluent. Nutrient-rich effluent, however, presented another set of problems, including oxygen depletion, sludge build-up, odors and insects. The lagoon reverted to the former regime of widely varying salinity and water surface area when the sewage effluent was diverted to the San Diego metropolitan sewer system and an ocean outfall in 1975. However, exceptionally high rainfall during the winters of 1978 and 1979 has caused the mouth to remain open during most of these years, thereby improving water quality significantly

and allowing marine communities to re-establish themselves.

Enhancement Needs and Constraints

Most of the lagoon's ecologic and aesthetic problems, including low aquatic faunal diversity, reduced habitat diversity, poor water quality, and high mosquito populations can be traced to the lack of water flow and circulation (either freshwater or tidal). To enhance the lagoon, it is of primary importance to make some changes in the lagoon's hydrology.

At least three alternative hydrologic systems are possible: a freshwater or brackish impoundment over the entire length of the lagoon channels, a partially impounded and partially tidal system, and an open tidal system, with or without a small freshwater segment. The impoundment alternatives might be difficult to keep supplied with fresh water and would have greater maintenance requirements, flood hazards, and potential for stagnation than the open tidal alternative. A permanently open tidal system would be difficult to achieve, given the small size of the lagoon. However, any substantial improvement in tidal flushing and water circulation in the lagoon, achieved by increasing the area of the lagoon available to tidal action, would significantly enhance the lagoon.

development and use features

Governmental Jurisdictions

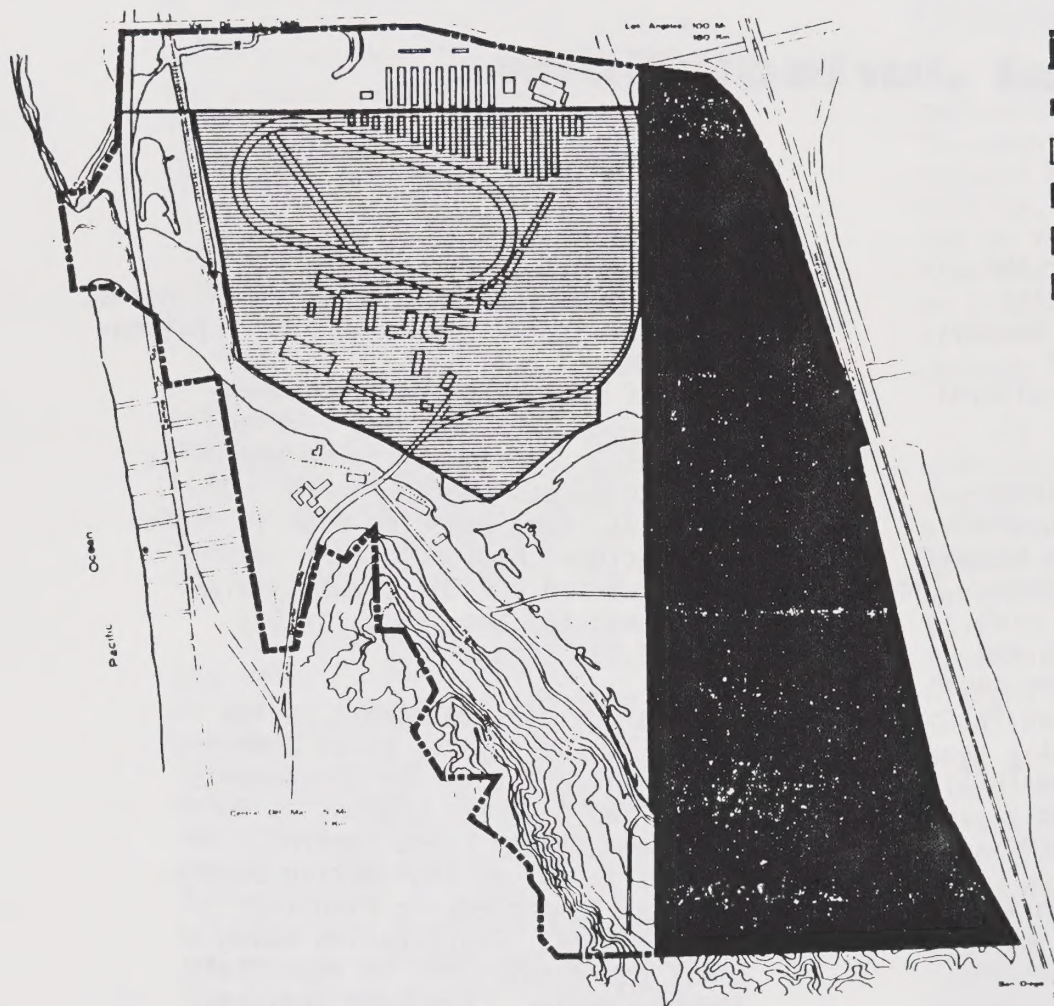
Four governmental entities have general jurisdiction over the lagoon planning area: the Cities of Del Mar and San Diego, the County of San Diego, and the State of California 22nd District Agricultural Association.

The lagoon area west of Interstate 5 is bisected in a north-south direction by the City boundary between Del Mar and the City of San Diego. The City limit coincides with the east edge of Turf Road at the north end and bisects Crest Canyon at the south end. The northern strip of the fairgrounds, approximately 500 feet south of Via de la Valle, from Turf Road to the ocean, lies in the County of San Diego jurisdiction.

Nearly all of the land north of the river to Via de la Valle, between the railroad and Interstate 5, is under the ownership and jurisdiction of the State of California 22nd District Agricultural Association. The exceptions are two small parcels east of Turf Road, one at the northern extreme at Via de la Valle and Turf Road, and the other at the southern extreme adjacent to the river.

A number of other agencies hold various levels of interest over activities taking place within the lagoon planning area. Federal agencies include: Army Corps of Engineers, U. S. Fish and Wildlife Service, Environmental Protection Agency. State agencies are: California Conservation Corps, Department of Fish and Game, State Lands Commission and State Water Resources Control Board. On the local level agencies with jurisdiction include: Regional Water Quality Control Board and the County Health Department and the Cities of Del Mar and San Diego.

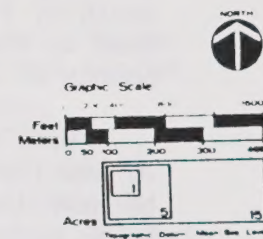
In addition to permit review authority, all of the above agencies have an interest in the management of the San Dieguito Lagoon, as do San Diego County Flood Control, City of San Diego Engineering Department and Comprehensive Planning Organization. Coordination among staff representatives is essential, though complex. Proposed actions for these agencies are found in Appendix A.



jurisdictions

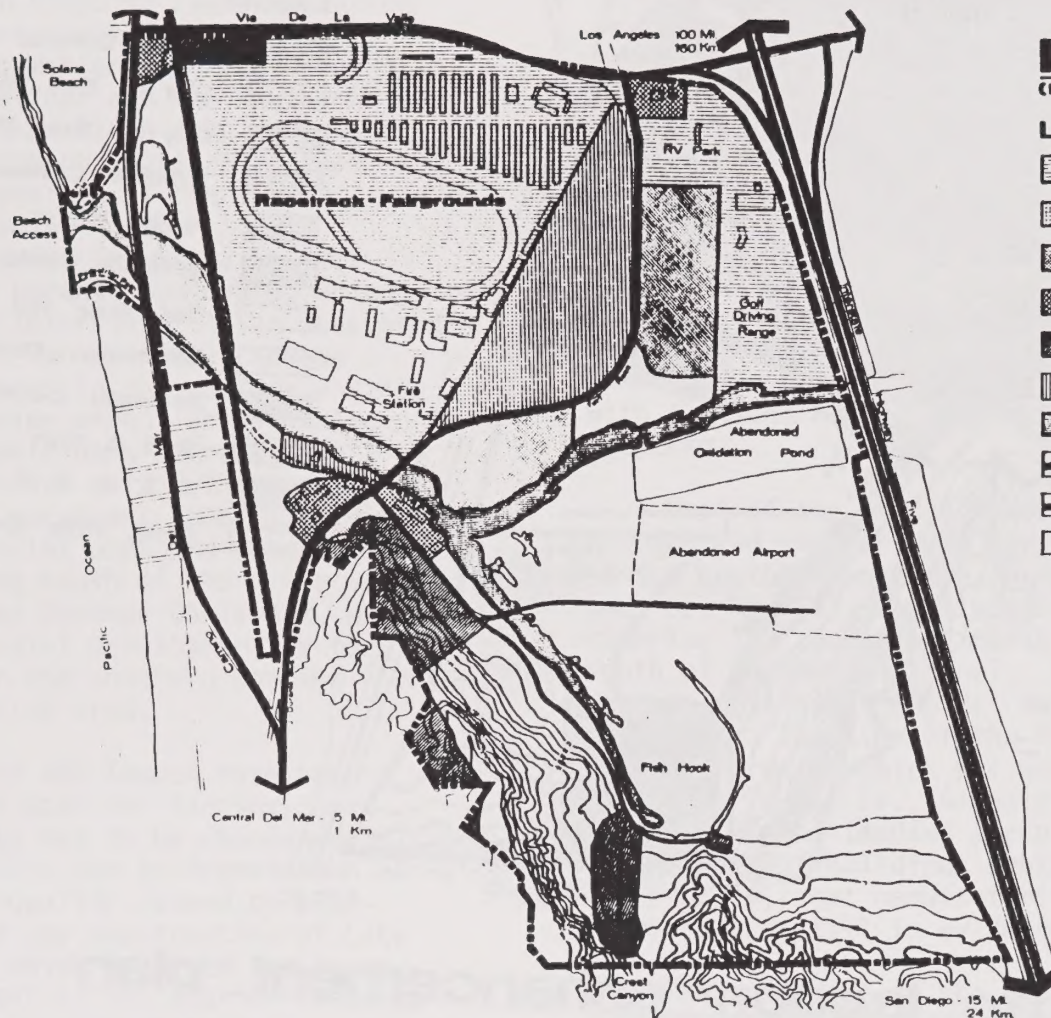
Legend

-  City of Del Mar
-  City of San Diego
-  County of San Diego
-  22nd Dist. Ag. Assn.



san dieguito lagoon enhancement plan

City of Del Mar, California • State Coastal Conservancy

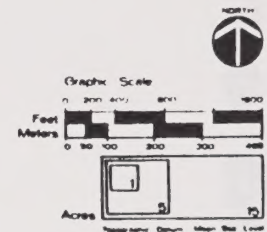


land use/access

(Existing Conditions)

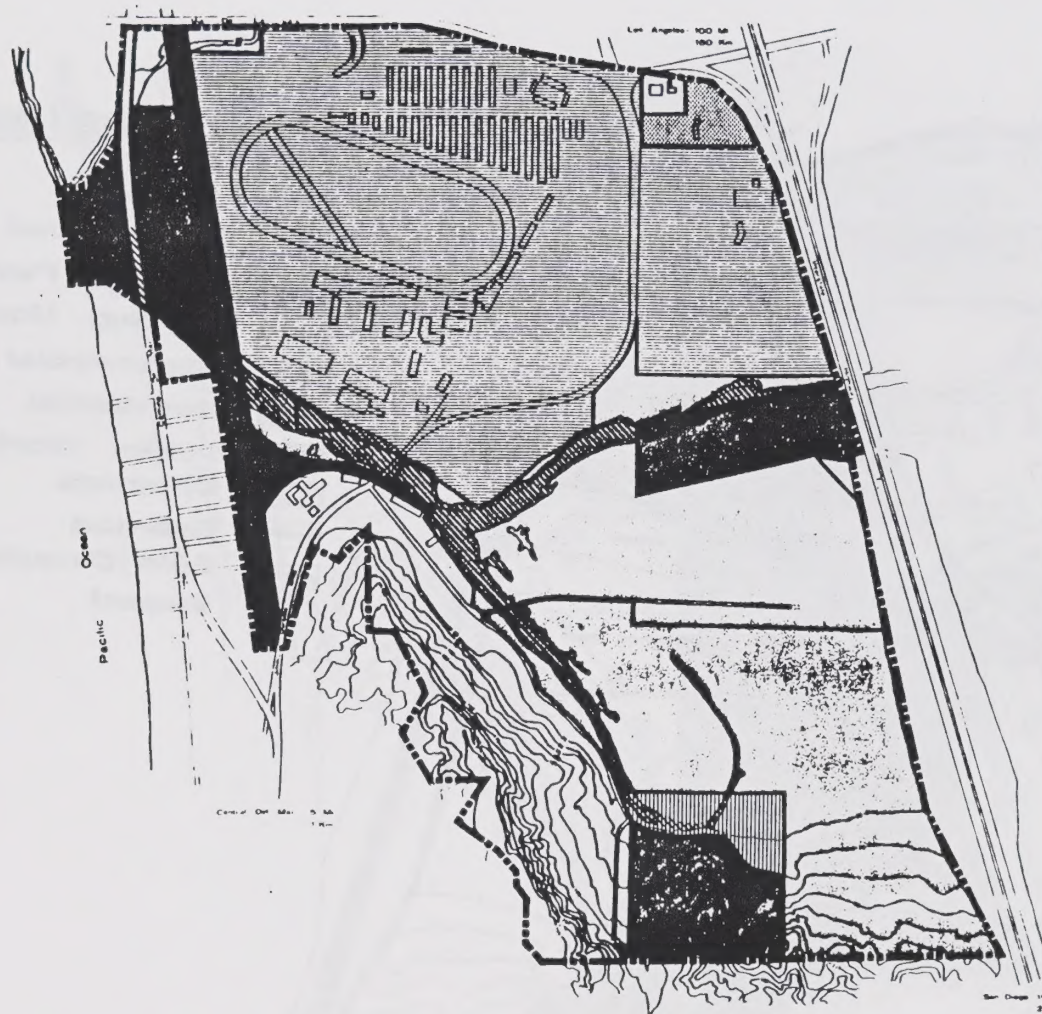
Legend

- Recreational**
- Parking - Paved**
- Parking - Unpaved**
- Commercial / Industrial**
- Residential**
- Public Works**
- Channels**
- Railroad**
- Auto Circulation**
- Vacant**



san dieguito lagoon enhancement plan

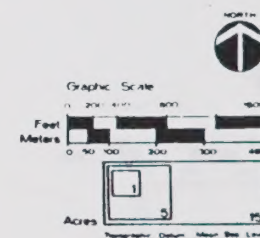
City of Del Mar, California - State Coastal Conservancy



land ownership

Legend

-  22nd District Agr. Assn.
-  City of Del Mar
-  City of San Diego
-  Wildlife Conservation Board
-  Public Trust
-  Scripps Clinic & Research
-  Del Mar 88
-  Cameron Mostaghi
-  Presidio Development Co.
-  Surf & Turf
-  A. T. & S. F. Rwy.
-  Misc. Priv. Owners



san dieguito lagoon enhancement plan

City of Del Mar, California - State Coastal Conservancy

Land Use and Ownership Patterns

The San Dieguito Lagoon planning area is characterized by several major developments: The 200 acre Del Mar Racetrack and the Southern California Exposition complex on the Lagoon's northern shore; five road and rail crossings of the lagoon channels (Camino del Mar, the Atchison, Topeka and Santa Fe Railroad, Jimmy Durante Boulevard, Grand Avenue, and Interstate 5); an abandoned airfield and two abandoned sewage oxidation ponds in the eastern portion of the planning area. The planning area also contains a recreational vehicle park and golf driving range east of the racetrack complex, various other commercial uses and some light manufacturing south of the river and west of Jimmy Durante Boulevard, and some residential development on the hillsides in the southern portion of the planning area.

Parts of the lagoon have been historically used for farming, but this activity had to be abandoned in the late 1930's due to degradation of groundwater quality caused by over-draft and by the construction of Lake Hodges Dam, which deprived the lower valley of most of its aquifer recharge supply. The San Dieguito Valley east of Interstate 5 is still used for grazing during part of the year, but no economically viable agricultural land exists in the planning area west of the freeway.

Although much of the upland area at San Dieguito Lagoon is publicly owned, the channel and wetland area is largely in private ownership but subject to the public trust in tidelands and submerged lands.

The Scripps Clinic and Research Foundation holds an 85% interest in 23.4 acres of land at the lagoon mouth and is currently exploring the property's development potential. The Wildlife Conservation Board is negotiating with the land owners to acquire this property.

Most of the lagoon's north channel and the northern portion of the south channel are owned by the "Del Mar 88", whose holdings comprise 102 acres both north and south of the north channel. The eastern portion of the Del Mar 88 property is the site of the former Del Mar Airport, which was used during World War II. Asphalt remnants of the landing strip and foundations of buildings subsequently used for light manufacturing industry are still in evidence.

The remainder of the south channel and the wetlands associated with the Fishhook channel are owned by Cameron Moshtaghi, who holds a total of 128 acres of land in the southeastern portion of the planning area. Moshtaghi plans a

23-unit residential development on a 40-acre parcel in the extreme southeastern corner of the planning area. The State Wildlife Conservation Board is negotiating with Moshtaghi regarding possible acquisition of this property.

Private ownership extends over most of the upland area south of the west and south channels and the Fishhook. The AT&SF Railway Co. holds a right-of-way across the west channel and a vacant triangle of land just east of the right-of-way. The area between this triangle and Jimmy Durante Blvd. is held by various private owners and contains light manufacturing and commercial uses. A major portion is still vacant but with a commercial development pending. The parcel on the south side of the Jimmy Durante Blvd./San Dieguito Drive intersection is currently used as race and fair parking during the summer, but is otherwise vacant.

The northeast-facing hillsides east of Jimmy Durante Boulevard are also held by various private owners and contain scattered single-family houses.

Public ownership in the lagoon planning area is divided among the State of California and the Cities of Del Mar and San Diego. By far the largest area is owned by the State of California 22nd District Agricultural Association, whose holdings comprise the 200-acre racetrack/fairground complex and a 50-acre parcel immediately to the east.

Development of the recreational complex was begun in 1933. The first County Fair opened at the facility in October 1936, and thoroughbred horse racing began the following summer. As shown on the land use/access map, much of the land in the complex is currently reserved for parking.

The City of Del Mar owns a few scattered parcels in the lagoon planning area, including a strip of land now occupied by public works facilities south of the west channel and east of the railroad, and the 6-acre Del Mar Bluff Preserve near the lagoon mouth. The City of San Diego owns the 14-acre abandoned oxidation pond adjacent to the north channel and Interstate 5. The City of Del Mar holds an option to lease this land.

The extent of State ownership of the lagoon tidelands and submerged lands has not yet been determined by the State Lands Commission.

Existing Land Use Regulations

Within the City limits of Del Mar, the lagoon area between Turf Road and San Dieguito Drive is zoned Floodway (FW) to prevent any uses which would restrict or be damaged by flood flows. (See pages 5-6 and 5-7 for a chart describing zoning designations). West of Jimmy Durante Blvd. the FW Zone includes the main river channel and spreads out from the west side of the railroad to cover the low areas west to the ocean. The south side of the river on both sides of Jimmy Durante Blvd. is designated North Commercial (NC) allowing low intensity commercial uses which provide a service to the community, "offering a lively open air commercial environment with substantial open space."

A floodplain overlay covers the portion of the NC Zone between Jimmy Durante Blvd. and the railroad, requiring a Conditional Use Permit and review by the City Engineer to assure that development will not constitute an obstruction to flood flow, nor create a hazard to life, property, or public health, safety or general welfare.

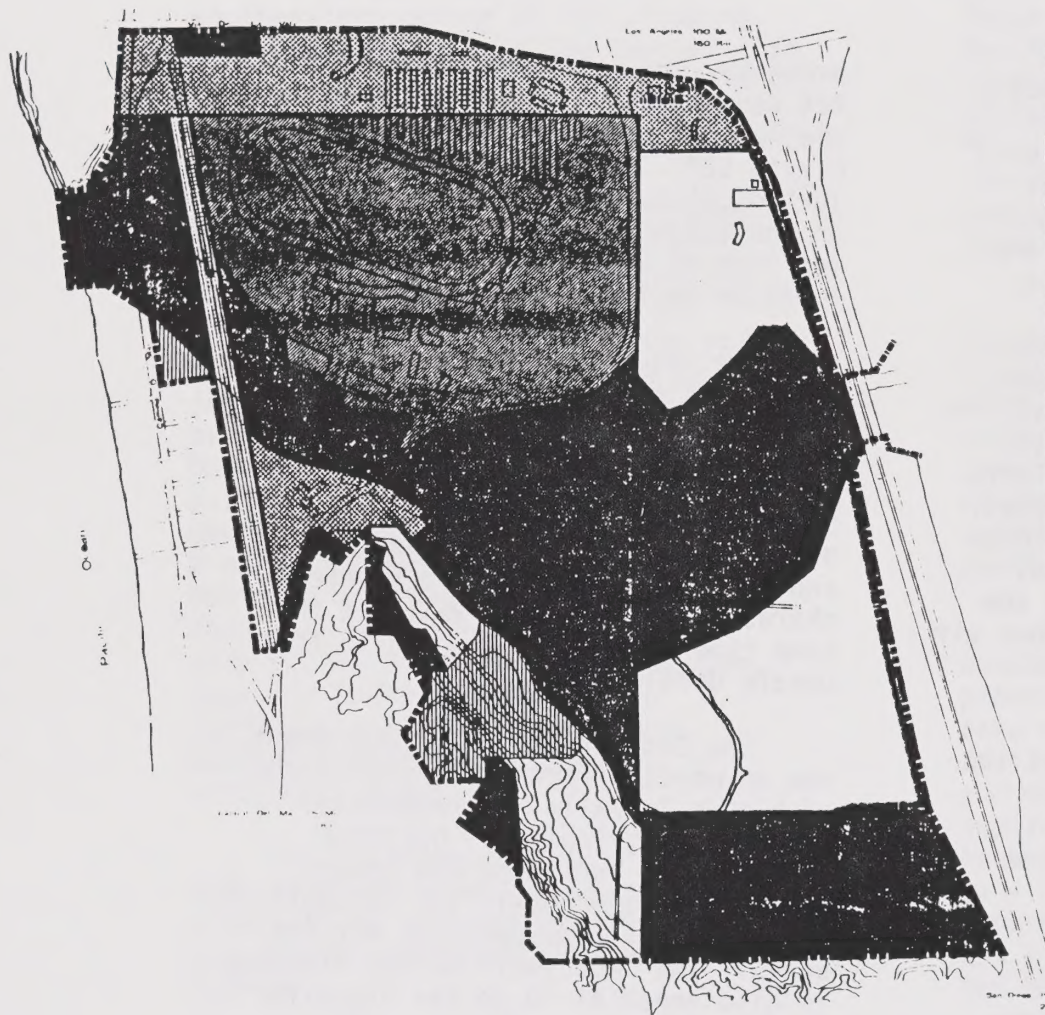
The portion of the fairgrounds/racetrack complex in Del Mar is covered by the FR Zone, leaving development decisions up to the 22nd Agriculture District which owns the

property. However, the Coastal Act requires that permitted uses be spelled out more specifically in the City's LCP. Within the County's jurisdiction, the area is zoned A70-8, an agricultural zoning with minimum lot size of eight acres because of its location in the floodplain.

The lagoon viewshed west of San Dieguito Drive facing the river valley to the east is zoned R1-40 allowing one unit per acre of residential development. The Bluff, Slope and Canyon Overlay seeks to preserve the scenic sandstone bluffs and canyons and steep slopes which characterize the area, while at the same time protecting the public from unsafe development.

The City of San Diego has zoned the commercial/recreation area south of Via de la Valle for commercial uses. The Agricultural District land between Turf Road and Interstate 5 is zoned A1-10 for agricultural uses, allowing one dwelling per ten acres. The land south of the floodway is also zoned A1-10 to San Dieguito Drive. The City's Floodway (FW) Zone coincides with the County's designation of the floodway.

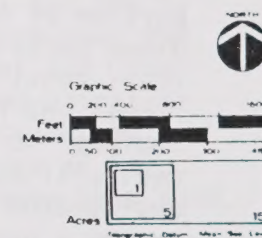
The privately owned portion of the hillside south of San Dieguito Drive is zoned R1-20, while the Crest Canyon Park acquisition is now zoned for Open Space.



zoning / floodlines

Legend

-  **Floodway**
-  **Fairgrounds / Racetrack**
-  **Commercial**
-  **Agricultural (A-1-10)**
-  **Med. Density Resid. (R-1-10)**
-  **" " Mixed (RM)**
-  **Low " Resid. (R-1-20)**
-  **Very Low Dens. Res. (R-1-40)**
-  **Railroad**
-  **Open Space Overlay**
-  **Floodplain Fringe**



san dieguito lagoon enhancement plan

City of Del Mar, California · State Coastal Conservancy

Recreational Access

The most visible and attractive beach access in the planning area lies at the entrance to the lagoon. The wide sandy beach is visible from Camino del Mar and limited parking is available along the highway. During the summer the area between the highway and the ocean provides a dog run and horse exercise area not available at other locations in the city. Unfortunately, the beach at the mouth of the river poses some hazards to swimmers. An off-shore reef generally perpendicular to the shore causes a fixed rip current which is dangerous to bathers unfamiliar with the ocean. A small shallow embayment at the mouth of the river provides protected bathing area but is inadequately protected by lifeguards and has its own hazards. When flowing, the river moves sand and erodes holes, causing unpredictable bottom conditions. The relatively warm water from the lagoon attracts sting rays as well. Finally, the area is littered with broken bottles and other trash, resulting in frequent minor injuries.

The cliffs above the north beach, though attractive to climbers, are unstable and hazardous. Numerous caves on the west face have high potential for collapse. East of the river mouth, between Camino del Mar and the railroad is an area which serves both as an important nesting and feeding area for a variety of water-associated birds and as an accessway for equestrian use and beach or fairgrounds pedestrian traffic.

The south bank of the river channel from Camino del Mar to about 100 yards east of the Jimmy Durante bridge offers pedestrian access for fishing or leisurely walking. The bank is uneven, sometimes unstable, and always littered with trash and broken bottles. Some of the industrial firms use the river for dumping trash and waste products, a practice which is both unsightly and hazardous to the environment, and may also constitute a public safety hazard. Grand Avenue is the only public roadway providing access over the Fishhook channel into the main lagoon area. The habitat value of that area precludes its use for most types of public access, but the resource provides exciting educational opportunities that do not exist elsewhere.

Enhancement Needs and Constraints

Pedestrian accessways on the lagoon periphery are limited in extent and unsafe and unattractive in certain places. To enhance recreational and educational opportunities in the planning area, the existing pedestrian and equestrian accessways can be improved, vehicular access to the main lagoon controlled and hazards and litter removed from the area.

Two major regional transportation arteries provide access to Del Mar: Interstate 5 to the east, carrying 96,500 vehicles per day, and Camino Del Mar to the west, with a traffic volume of 10,600 vehicles per day. The nearest freeway offramp is at Via de la Valle, which forms the northern boundary of the lagoon planning area.

Turf Road provides access to the fairgrounds from Via de la Valle, with congestion being a problem only during the peak periods of the fair and races. Recent design and signaling improvements at the Via de la Valle/Turf Road intersection were successful in somewhat reducing congestion during the 1979 season.

Jimmy Durante Blvd. connects the Village Center of Del Mar with the recreational facilities at the north end of town. The bridge which crosses the San Dieguito river south of the fairgrounds is substandard and slated for replacement in 1981. A study has already been initiated on that project and is being coordinated with this planning effort.

San Dieguito Drive, which intersects Jimmy Durante Blvd. south of the river, winds south to Crest Canyon then east to Interstate 5, providing the western and southern boundaries of the lagoon. It is narrow and curving, with inadequate visibility for two-way traffic. However, it serves only 31 homes at this time, and no immediate plans are made for its improvement, which could involve adverse environmental impacts to the lagoon's south channel and Fishhook area.

Grand Avenue provides the only access road to the main portion of the lagoon east of the Fishhook, via a bridge across the South Channel. In San Diego it becomes a private road providing access to the old airport site. The bridge is in disrepair and the roadway has not been maintained for several years.

Enhancement Needs and Constraints

The disrepair of the Jimmy Durante bridge and the hazardous driving conditions on San Dieguito Drive suggest the desirability of roadway improvements in these two areas. Road widening and bridge construction can adversely impact the lagoon and would require adequate mitigation.

summary of enhancement needs

This chapter's inventory of existing conditions at San Dieguito Lagoon has identified a series of enhancement needs and opportunities which are summarized below.

Habitat Types. The relatively low habitat diversity at San Dieguito and the relative scarcity of certain ecologically valuable habitat types such as mudflats, ponds and freshwater marsh point out the need to increase the variety of habitats in the lagoon and the area now occupied by the rarer habitat types.

Flora. The poor health of the existing vegetation, the relatively low diversity of plant species and vegetation types, and the high proportion of introduced species indicate the need to control trampling of vegetation, landfilling, water pollution, sedimentation and other adverse impacts on lagoon vegetation; the desirability of reintroducing species characteristic of healthy tidal marshes (e.g. *Spartina*) by improving tidal action; and the need to protect the two rare plant species still found at the lagoon.

Fauna. The presence of a variety of wetland-dependent birds at San Dieguito Lagoon suggests the desirability of enhancing those habitats with which they are most closely associated, i.e. open water, mudflats and, to a lesser extent, intertidal and freshwater marsh. The presence of two endangered bird species and the poor nesting success of at least one of them (the least tern) due to human and animal disturbance suggests the desirability of some enhancement measures aimed at protecting these two species, specifically by providing nesting and feeding habitat protected from intrusion.

The relatively low diversity of aquatic invertebrates and fish, especially when the lagoon is closed, indicates that an open lagoon mouth should be maintained and the area of aquatic habitat in the lagoon expanded. The low diversity and abundance of reptiles, amphibians and mammals reflects the degraded condition of the lagoon's upland habitat and the relative lack of freshwater habitat in the area. This indicates the need to expand freshwater marsh and pond habitat and to enhance upland habitat by increasing the structural diversity of the vegetation and the proportion of native plants.



Geology and Soils. The instability of the lagoon sediments creates the need to restrict development on these sediments. The high erodibility of several rock and soil types in the lagoon watershed, along with the sensitivity of the lagoon to sedimentation, make it particularly desirable to control erosion in the watershed. The visual beauty of the geologic formations at San Dieguito Lagoon can be retained by protecting these formations and views of them.

Hydrology. The existing problems of low aquatic faunal diversity, reduced habitat diversity, poor water quality, periodic flooding or stagnation, and high mosquito populations all reflect the lack of water flow and circulation in the lagoon and indicate the need to increase the lagoon's water supply and improve water circulation by increasing tidal exchange.

Governmental Jurisdictions. The large number of governmental agencies with planning or regulatory jurisdiction over the lagoon creates the need for on-going coordination of planning and implementation of an enhancement program for the lagoon.

Land Use and Ownership Patterns. The fact that virtually all the sensitive lagoon area requiring enhancement is in private ownership indicates the need for a public acquisition program. Local development regulations are adequate for the existing conditions, but implementation of enhancement work will require certain changes.

Recreational Access. The presence of trash and safety hazards on the existing pedestrian and equestrian trails indicates the need to improve the appearance and safety of accessways on the lagoon periphery. However, care must be taken to limit or control access where human and pet intrusion would conflict with the need to protect the wildlife. Full utilization of the educational potential of the lagoon would increase the value of the wetlands to the public.

Vehicle Circulation. The disrepair of the Jimmy Durante bridge and the hazardous driving conditions on San Dieguito Drive suggest the desirability of roadway improvements in these two areas. Road widening and bridge construction can adversely impact the lagoon and would require adequate mitigation measures which will be identified in the environmental review process.



san dieguito lagoon enhancement plan

introduction

This chapter presents the site improvements and design decisions necessary to create an "enhanced" lagoon. It is the portrayal of the physical features which will increase the environmental and recreational values of the San Dieguito Lagoon, and is graphically represented by the lagoon enhancement plan map on page 3-11. Numbered areas referred to in the discussion (such as "Area IX-B") are referenced on the code map on page 3-10 and on the inside back cover.



OBJECTIVES

The following objectives have helped guide research and decision-making toward the goal of lagoon enhancement:

1. Protect the existing environmental values of the lagoon;
2. Enhance water circulation and tidal flushing in the lagoon;
3. Improve or create a variety of habitats to increase wildlife diversity and ensure protection of endangered species;
4. Facilitate recreational access, vehicle circulation, educational and scientific activities, and any coastal/water dependent uses which do not significantly diminish resource values.

CREATING A MARINE ENVIRONMENT

Two key issues in lagoon restoration work in California are whether and how to keep the lagoon mouth open to tidal flushing. Alternatives to keeping the mouth open include: 1) leaving the lagoon in its present condition, in which the mouth is closed much of the year; 2) turning the lagoon into a brackish water impoundment by permanently closing the mouth; or 3) leaving a lower part of the lagoon in its present condition and making an upper portion into a fresh water or brackish impoundment. The following excerpt from the DFG report, Natural Resources of the San Dieguito and Batiquitos Lagoons (page 82), supports the open marine status:

"Regardless of the method used in restoring tidal conditions to these lagoons, it can be stated unequivocally that a stable, tidal regime in the lagoons will permit the rapid (e.g., within two to four years) establishment of large numbers of marine fish and shellfish, in addition to providing support for a wide diversity of aquatic birds; and, it would permit the restoration of salt marsh lands which play an important role in sustaining the productivity of lagoon ecosystems and nutritionally enrich near-shore coastal waters. Tidal lagoon systems would also reduce the pollution and insect problems that currently plague

these wetland areas, alleviate flood control problems while allowing the natural transport of sand to adjacent beaches, and create the potential for mariculture, the commercial cultivation of marine organisms..."

This enhancement plan seeks to establish a marine environment in the lagoon, based on the strong evidence that this will create the most productive biological state, that water quality will improve, and that mosquito breeding will be reduced. To reach these ends it is necessary that the lagoon mouth remain open. Accomplishing this requires the excavation of enough ponds, flats, and marshy areas in the interior to ensure that a large volume of water can be moved back and forth by the ocean's tidal action. (This volume of water moved by one tide is called the "tidal prism".)

The design of this enhancement plan, based on a series of tidal basins and channel expansions, is intended to secure an adequate tidal prism. However the state-of-the-art in this area of oceanographic engineering is not sufficiently advanced to guarantee a permanently open lagoon mouth. However, it is believed that, at a minimum, the increased water surface and prism will at least keep the lagoon mouth open for longer periods between closings, thereby making manual openings less difficult, frequent and costly.

This assumption, plus the clear gain of new and valuable aquatic habitat, is believed to justify the water-related site alterations proposed in this chapter. If future monitoring of the modified lagoon identifies a continuing deficiency in the tidal prism and circulation, it will be necessary to expand the tidal areas or seek other engineering solutions.

COMPONENTS OF THE ENHANCEMENT PLAN

In addition to the construction of tidal basins and expansion of channels to improve the tidal prism and flushing action, this enhancement plan proposes the creation of fresh-water marsh, enhancement of habitat areas for endangered species, a general clean-up of the lagoon, improvement of existing pedestrian trails and viewing points, installation of educational signs, and construction of a permanent entrance to the ecological reserve. Roadway realignments or improvements which would not harm the lagoon are recommended for safety reasons or for maintenance access to the lagoon.

The plan also suggests potential additional uses for future consideration. The following sections discuss each site improvement and activity in greater detail.

The proposed enhancement plan will create, over a period of years and with adequate financing, a vital, productive marine environment in the San Dieguito Lagoon. There will be a greatly enhanced fish and invertebrate resource and an increased shorebird and waterfowl population. Upland species will also benefit.

design criteria

This section illustrates how the research and decision-making process has led to specific proposals for site alterations and improvements. From the technical input and information gained from the physical inventory (see Chapter Two), it has been possible to develop "design guidelines" which support, but are more specific than, the objectives. In turn these guidelines have led to the identification of "design actions" which are quite specific and implement the statements of intent.

Research for this program has also led to the compilation of general guidelines regarding wetlands management which are presented in Appendix D. These principles offer further insight into the methodology of lagoon restoration and enhancement.

In summary this section provides the connection from the policy objectives, physical inventory, and environmental impact assessment to the design decisions regarding site alterations. The process is outlined below.

I. OBJECTIVE: PROTECT THE EXISTING ENVIRONMENTAL VALUES OF THE LAGOON.

A. Design Guideline:

The integrity of existing, functioning natural systems (topography, hydrology, vegetative cover) should be disturbed as little as possible.

Design Actions:

1. Unless other constraints are controlling, locate tidal basins and channel extensions at the lowest topographic contours, to minimize alteration of terrain.
2. Locate southern tidal basin/mudflat (Area X-A) away from the freshwater drainage area/winter marsh (Area X-C) and existing Salicornia marsh.
3. Locate northern tidal basin within old levees of abandoned oxidation pond (Area X-C) to minimize alteration of terrain and avoid destruction of Salicornia marsh.
4. Minimize use of the heavier types of equipment in excavation work.

II. OBJECTIVE: ENHANCE WATER CIRCULATION AND TIDAL FLUSHING IN THE LAGOON

A. Design Guideline:

Land alterations should expand the water surface (with increasing depth of channels a secondary function) to improve the tidal prism and increase aquatic habitat.

Design Actions:

1. Create three tidal basins approximately doubling the water surface area of the lagoon.
2. Widen and extend the Fishhook channel.
3. Deepen channels, as economically feasible, to reduce friction and drag on tidal exchanges of water.

B. Design Guideline:

The land alterations should create a pattern of water circulation and flushing which reduces mosquito breeding, stagnation and pollutant buildup.

Design Actions:

1. Connect the northern tidal basin to the south river channel near its juncture with the north channel, and connect the northern and southern tidal basins with a pipe underneath Grand Avenue, to make maximum use of tidal action to drive water circulation.
2. Extend the Fishhook channel (Area X) into a loop connecting with the south channel just below Grand Avenue.
3. Install windmill-driven pumps in the new freshwater marsh (Area VIII) to provide enough water movement and aeration to prevent stagnation.

C. Design Guideline:

Land alterations should be located so as to reduce the risk of their being destroyed by a flood.

Design Actions:

1. Connect the northern and southern tidal basins to the south channel and Fishhook, which do not carry flood waters.
2. When economically feasible, deepen the main river channel to increase its flood-carrying capacity.

III. OBJECTIVE: IMPROVE OR CREATE
A VARIETY OF HABITATS TO IN-
CREASE WILDLIFE DIVERSITY AND
ENSURE PROTECTION OF ENDANGER-
ED SPECIES.

A. Design Guideline:

The lagoon's endangered bird species should be isolated from human and animal intrusion, and their habitat should be protected from the adverse impacts of site alterations.

1. Design Actions:

- Establish a fenced nesting preserve for least terns in an area historically by this species (Area VI), and create islands suitable for resting and nesting in the tidal ponds (Area IX-C and X-B).
2. Complete the Fishhook loop to isolate and revitalize an area of distressed Salicornia, thereby protecting and expanding the habitat of Belding's Savannah Sparrow.
3. Locate basins to avoid Salicornia along waterways, to protect the habitat of Belding's Savannah Sparrow.
4. Select and operate excavation equipment to minimize impact on existing Salicornia; minimize use of dredgers and dragline, unless the latter can work from a non-vegetated area.

B. Design Guideline:

The diversity of the spatial pattern of habitat types should be increased, and ecotones (transition zones between different habitat types) should be developed.

Design Actions

1. Create additional mudflat, pond and freshwater marsh areas, each of sufficient size to be useful to wildlife species, to increase the proportions of these relatively rare habitat types at the lagoon and so increase overall habitat diversity.
2. Locate new mudflat, pond, salt marsh and freshwater marsh areas so as to create a heterogeneous spatial pattern of habitat types.
3. Create edge cuts and indentations along channels, as feasible, to enhance the diversity of aquatic habitat.
4. Retain existing vertical structures and add new ones, including pilings in the water and trees on land, to enhance the diversity of habitat for aquatic invertebrates, fish and birds.

IV. OBJECTIVE: FACILITATE RECREATIONAL ACCESS, EDUCATIONAL AND SCIENTIFIC ACTIVITY AND ANY COASTAL-OR-WATER-DEPENDENT USES WHICH DO NOT SIGNIFICANTLY DIMINISH RESOURCE VALUES,

A. Design Guideline:

Recreational access for educational viewing should be controlled and sited to minimize impact on wildlife.

Design Actions:

1. Locate lagoon viewing site, fishing sites and trails in appropriate areas which are already heavily used.
2. Provide fencing or vegetated berms between areas of human activity and sensitive habitat areas. (For the Least Tern nesting preserve, rely on fencing to protect the Terns and retain the open vistas favored by the species.)

B. Design Guideline:

Any physical structure, roadway improvement or other development, should be located and designed to protect wetlands, scenic values and wildlife habitat.

Design Actions:

1. Place trees and vegetated berms between human use areas and wildlife habitat, wherever feasible.
2. Require substantial mitigation for loss of vegetation adjacent to the lagoons.
3. Require structures adjacent to the lagoon to be "subservient" to the terrain in design, coloring and materials.

components of the plan

Improvements of Tidal Areas

TIDAL BASINS

Construction of three new tidal basins is proposed in order to increase the lagoon's tidal prism (for improved flushing) and to increase the aquatic habitat area. Together with the proposed channel enlargements, tidal basin construction will expand the area of the lagoon subject to tidal action from about 40 to 70 acres, increasing the tidal prism by 50 to 70 percent. Although there is no guarantee that this increase will be sufficient to keep the lagoon mouth open permanently, it will at least keep the mouth open for a longer period during the year and reduce the need to remove the sand bar mechanically.

The sites proposed for tidal basin construction were selected on the basis of their present low value to wildlife, low elevation, proximity to lagoon channels and, for Area IX, the existence of levees from an abandoned sewage pond.

Three tidal basins are proposed for construction along the lagoon channels:

The "railroad triangle" (Area IV). a 3.5-acre parcel of vacant land, now separated from the lagoon's west channel by the railroad embankment, would be excavated and joined to the west channel by a pipe. This will result in about three acres of new water surface, increasing the lagoon's overall tidal prism by about ten percent.

An added benefit would be the improved flushing of the area, eliminating mosquito breeding problems which occur when standing water builds up in the depressed area.

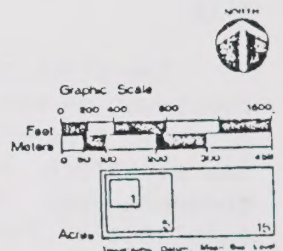
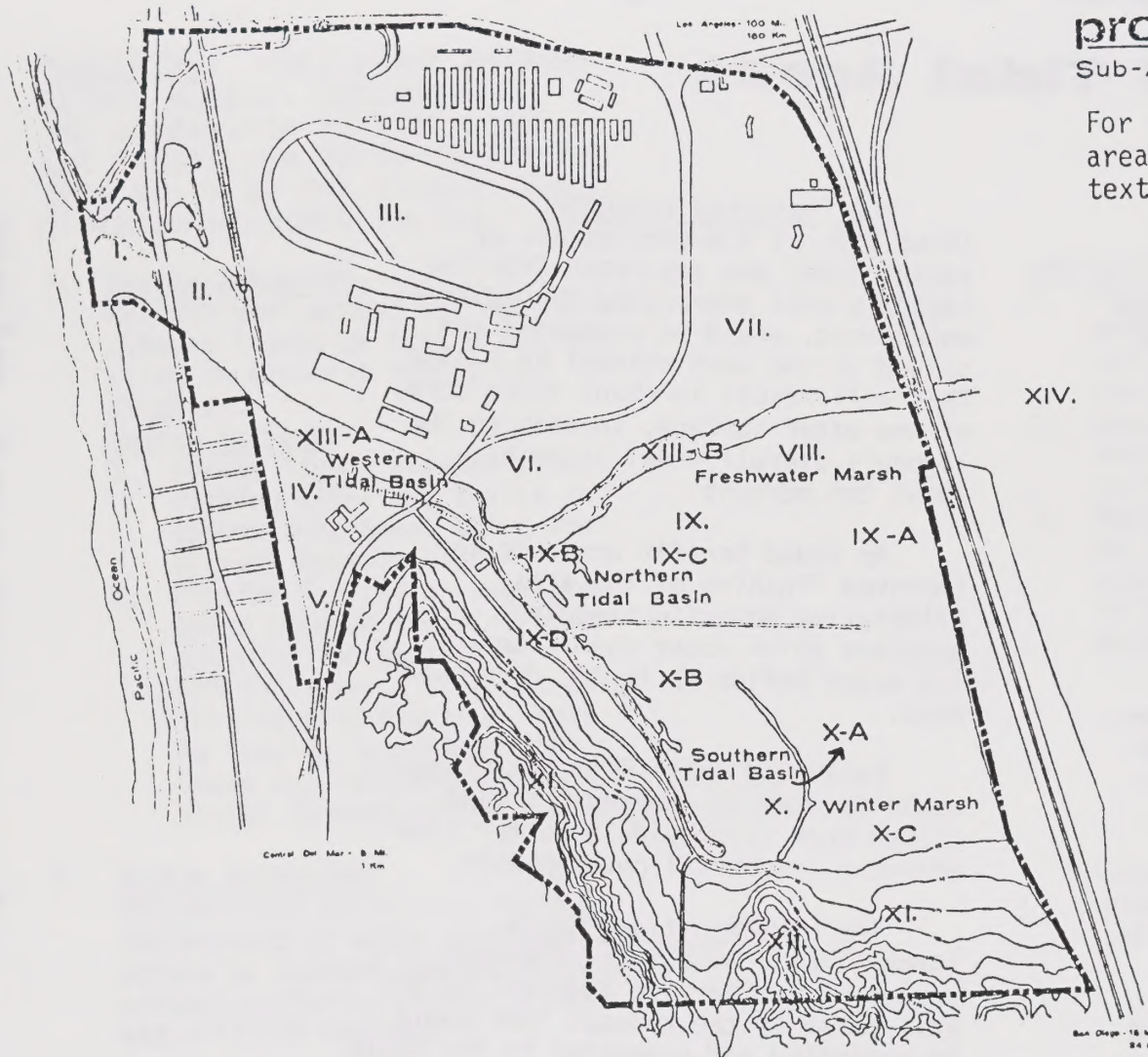
Excavated soils from the project would be used to construct a landscaped berm to provide a buffer from adjacent commercial developments.

The northern tidal basin (Area IX-C). An abandoned 8-acre sewage oxidation pond adjacent to the salt marsh at the channel fork would be excavated and connected to the south channel with a new channel. The levees surrounding the pond would be reconstructed and other existing channels cleared out to improve water circulation in the area.

proposed project

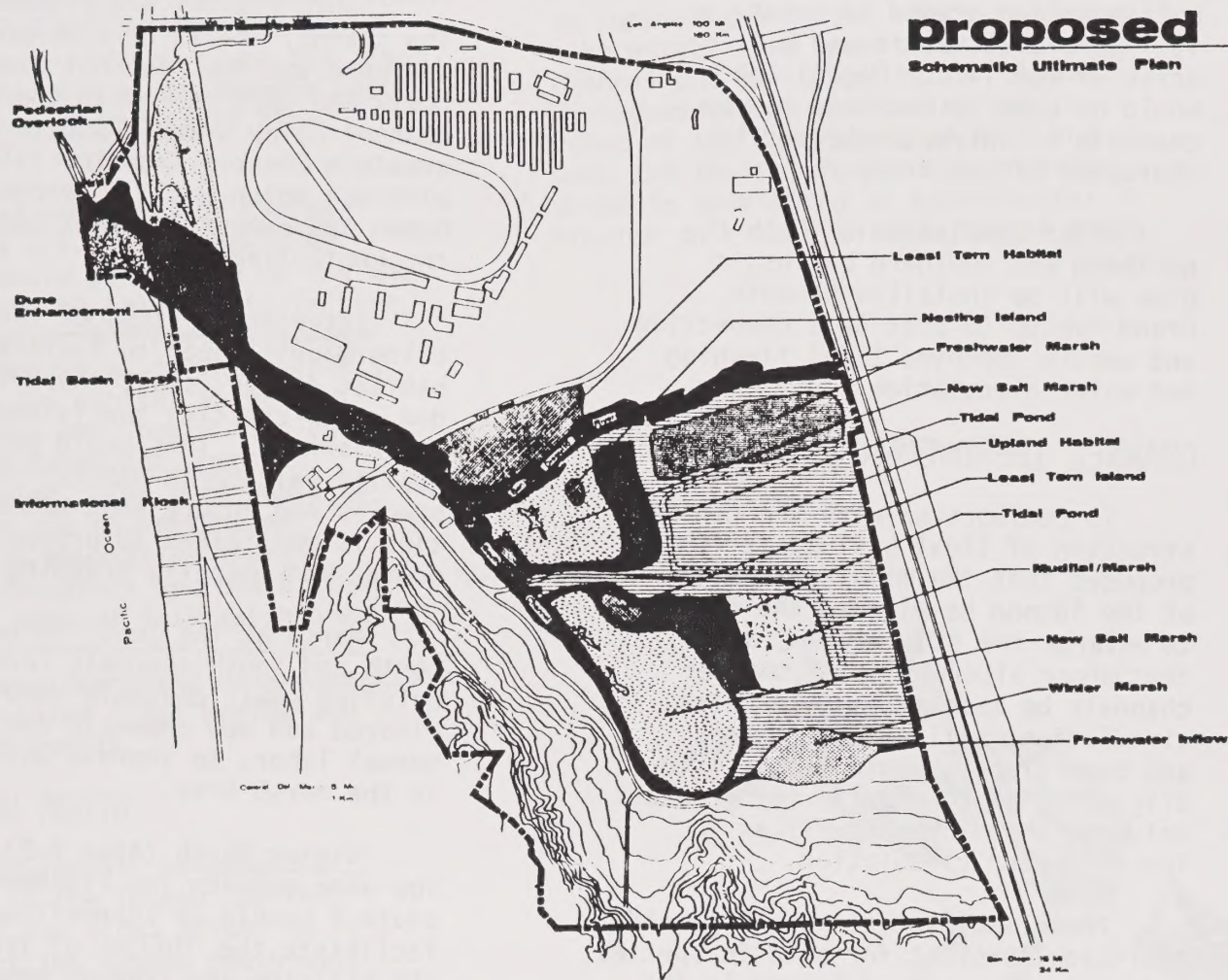
Sub-Area Reference Code

For use in locating ground areas when referred to in the text of the plan.



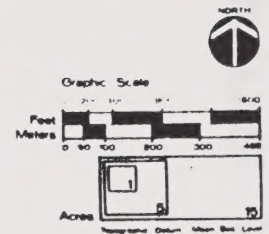
san dieguito lagoon enhancement plan

City of Del Mar, California • State Coastal Conservancy



proposed project

Schematic Ultimate Plan



san dieguito lagoon enhancement plan

City of Del Mar, California • State Coastal Conservancy

The southern tidal basin (Area X). The area adjoining the eastern arm of the Fishhook would be excavated and graded to create a 10.1-acre tidal basin and 5.7 acres of mudflats. Manual labor would be used to excavate narrow channels to increase the marshy character of the area.

After completion of both the northern and southern basins, a pipe will be installed beneath Grand Avenue to provide a connection and ensure improved tidal flushing and water circulation.

CHANNEL IMPROVEMENTS

In conjunction with the construction of tidal basins, it is proposed that the major channels of the lagoon be widened and deepened to enlarge the tidal prism, and that minor alterations of smaller channels be made to improve water circulation. All channel depths and bank slopes should be specifically designed to provide the greatest value to the biota as well as to improve water circulation.

These improvements would provide additional habitat for aquatic species, and also reduce flood hazard in the planning area.

Channel improvements are proposed for the following specific areas:

South Channel and Fishhook (Area X). The channel should be widened and deepened and the Fishhook extended north and west to rejoin the south channel below Grand Avenue. This will create a 20-acre interior island for bird use which would be protected from human and domestic animal intrusion by the encircling channel.

Interior of Fishhook (Area X-B). Using manual labor to avoid extensive habitat damage, small channels should be dug criss-crossing the island within the Fishhook. This would provide high quality salt marsh habitat for aquatic species and ensure that water circulation is maintained to prevent stagnation, odors, and mosquito breeding.

Marsh at the junction between the north and south channels (Area IX-B). Existing small channels should be cleared and new channels dug, again by manual labor, to improve water circulation in the marsh area.

Winter Marsh (Area X-C). The existing low area between the Fishhook and Interstate 5 should be channelized to facilitate the inflow of fresh water from the hillside and freeway embankment during winter storms. This flow creates an intermittent freshwater marsh of value to migrating waterfowl.

North and west channel (Area XIII-B). Deepening of the main river channel should be accomplished to increase the flood carrying capacity of the river for flood protection, as well as to improve water circulation and reduce tidal flow friction.

Marsh and pond east of Camino del Mar (Area II). This low-lying marsh area should be cleaned up and the channels should be enlarged to improve water circulation and prevent stagnation. Some deepening of the channels will enhance the habitat value for aquatic species and should also reduce the amount of human and domestic animal intrusion. The work would be planned so as not to prevent or interfere with equestrian traffic between the racetrack and beach along the southern edge of this marsh area.

See Appendices B and C for details about the proposed tidal basins and channel improvements.

OPEN LAGOON MOUTH

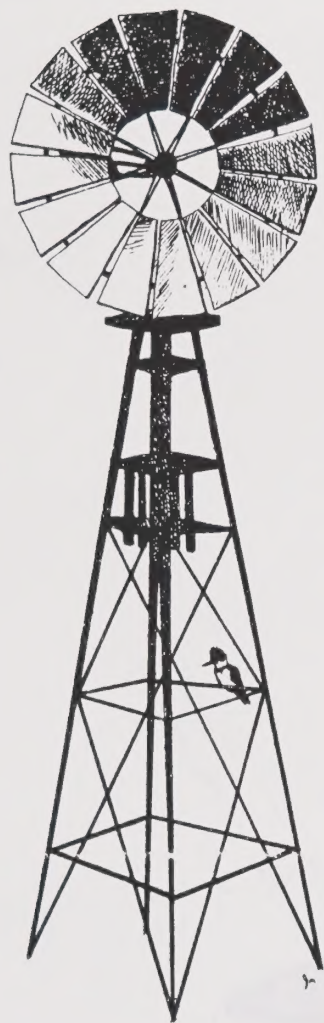
With the improvements of water circulation in the lagoon and the expansion of the tidal prism, it is expected that the lagoon mouth will remain open throughout all or at least most of the year. If experience shows that the expanded tidal prism is still insufficient to maintain tidal flushing, the mouth of the lagoon should be mechanically (by hand or bulldozers) opened at regular

intervals. This will ensure that adequate water quality is maintained in the lagoon to support the marine species which will have established themselves in the channel and marsh habitats. Chapter IV discusses lagoon monitoring and the roles of the Department of Fish and Game and the California Conservation Corps in developing an experimental program to ensure an open lagoon mouth.



Wildlife Habitat Improvements

FRESHWATER MARSH CONSTRUCTION



It is proposed that the abandoned 14-acre oxidation pond adjacent to the north channel and Interstate 5 (Area VIII) be converted to a freshwater marsh and islands suitable for bird nesting. Creation of the marsh would return freshwater wetland habitat to the planning area. This improvement will greatly increase the overall species diversity and increase productivity in the lagoon area. Conversion of the oxidation pond to marsh would require minor excavation and grading, and supplying the pond with water.

About 70 acre-feet of water must be diverted from the San Dieguito River at peak spring flow. Water losses to evaporation and seepage (up to 40 acre-feet a year) would be replaced from groundwater supplies. Present analysis indicates that water pumping by two windmills, augmented by winter rains, should replace the losses. Prior to implementation of this phase, a more thorough analysis of wind patterns and windmill performance is necessary. Adequate aeration may be achieved by the circulation caused by pumping, but if not, the windmills should generate enough power to run the necessary equipment to prevent eutrophic conditions.

ENDANGERED SPECIES HABITAT

The new salt marsh, mudflat and open water areas created by the proposed tidal basin and channel improvements would provide additional feeding habitat for least terns and feeding, resting and nesting habitat for Belding's Savannah Sparrows.

It is also proposed that nesting habitat for Least Terns be enhanced in three areas described below. The sites were selected because of their existing relatively high elevations, their proximity to water areas for tern feeding, isolation from human and domestic animal disturbance, and/or history of nesting or resting use.

Northern tidal basin (Area IX-B).
An area of higher ground in the salt marsh just west of the proposed tidal basin would be raised further and covered with a layer of light-colored sand, a surface favored by nesting terns.

Southern tidal basin (Area X-B).
In extending the Fishhook to meet the south channel, a small island of higher ground would be left within the Fishhook channel extension and covered with light-colored sand.

UPLAND HABITAT

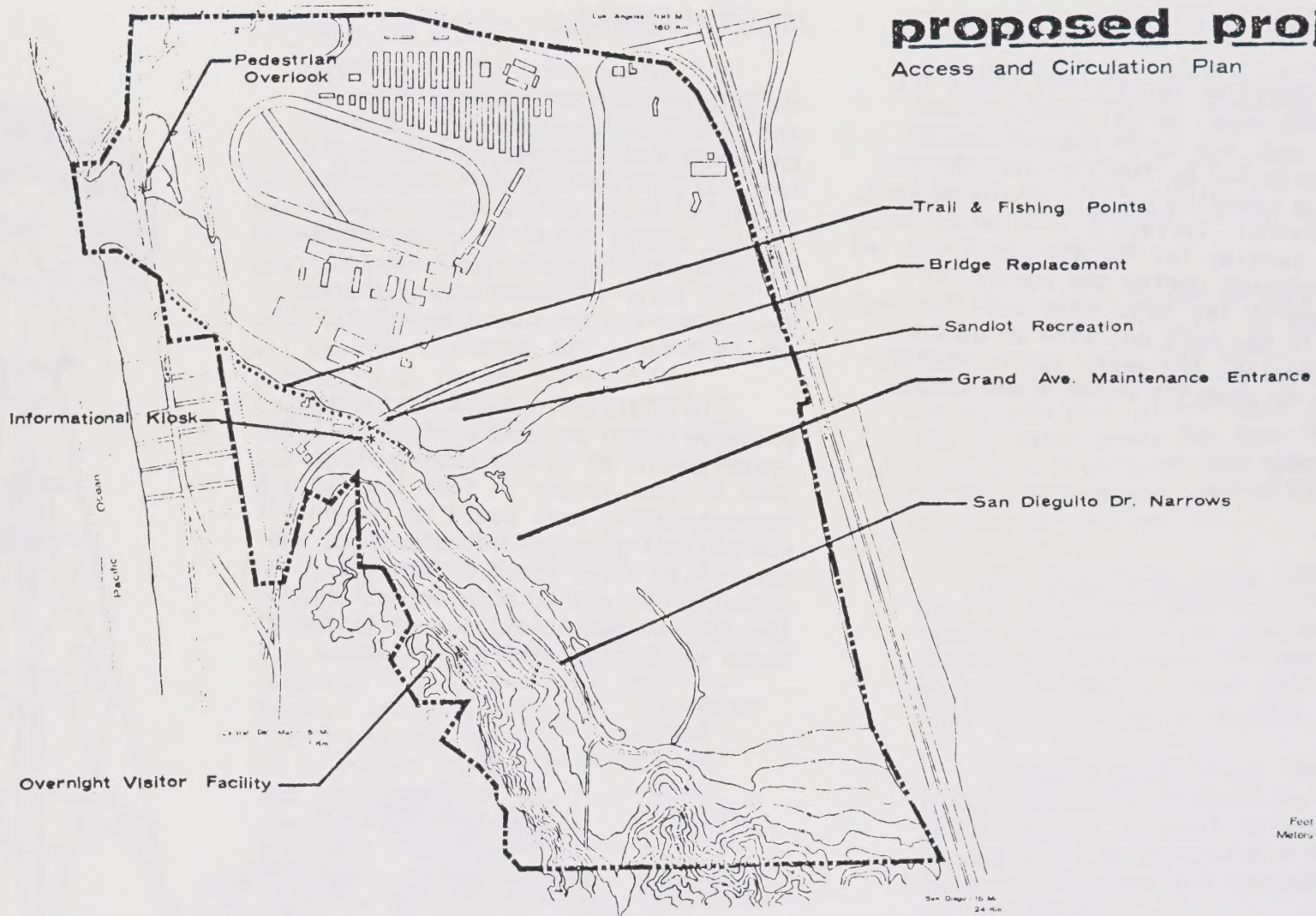
Overflow parking lot (Area VI).

A 12-16-acre parcel between Turf Road and the north channel would be protected by fencing and enhanced with a covering of light-colored sand. The parcel, currently used as an overflow parking lot for the racetrack and fairgrounds during the summer, is one which the terns have used for nesting in the past but with no success in the last ten years due to disturbance by domestic animals and people.

All upland areas of the proposed ecological reserve (largely Areas IX and X) should be cleared of rubble and weeds and revegetated with native species. In their present disturbed condition these upland areas receive limited use by wildlife. The recommended improvements would increase the habitat value of these areas, thereby increasing the abundance and diversity of wildlife at the lagoon.

In addition, a sand dune plant preserve would be created in Area I to protect rare or unique native plants from further losses to foot traffic. A representative area would be fenced off, educational signs would be posted, and non-native flora would be removed. This preserve could also provide habitat for the Globose dune beetle, a rare species known to inhabit dune vegetation.





proposed project

Access and Circulation Plan

san dieguito lagoon enhancement plan

City of Del Mar, California - State Coastal Conservancy

Improvements for Public Access

SCENIC IMPROVEMENTS, PUBLIC ACCESS, AND RECREATIONAL/EDUCATIONAL OPPORTUNITIES

All the site improvements described above would substantially improve the scenic quality of San Dieguito Lagoon by creating greater vegetative diversity, more open water and less stagnation. To enhance scenic values further, the plan proposes a general clean-up of debris throughout the lagoon to be conducted partially by a volunteer citizens effort. Ongoing maintenance will attempt to retain the lagoon's uncluttered scenic appeal and to remove safety hazards from the area.

Proposed improvements in recreational access to the San Dieguito Lagoon include both control of direct access to the resource and provision of recreational opportunities within the buffer areas. Direct access must be restricted because of the impact it would have on the ecologically sensitive resource area. Educational use and maintenance activities will be carefully controlled to minimize any negative impacts on the ecosystem.

Several measures are proposed to encourage recreational and educational uses that do not harm lagoon resources:

improvement of pedestrian trails on the periphery of the wetlands; construction of an informational kiosk at the intersection of Jimmy Durante Blvd. and San Dieguito Drive; installation of educational signs; establishment of a program of public involvement in lagoon restoration and maintenance; and development of a controlled trail for educational tours of the lagoon. Active recreational use (volleyball and other sandlot sports) of the least tern nesting preserve in Area VI would be encouraged in the off-season (September-March) when the terns are not nesting.

Access in the buffer areas should be encouraged and facilitated. The trails along the water's edge can be improved by establishment of an ongoing clean-up and maintenance program, control of dumping, and erection of appropriate signing. In addition, pedestrian overlook and access areas should be enhanced at various locations, as follows:

1. Retain a 50-foot pedestrian accessway along the south bank of the river channel between Camino del Mar and the railroad right-of-way. Post a "pedestrian access" sign.



2. Construct a bench for pedestrian use on the north side of the river channel, east of the highway, overlooking the lagoon (Area II). Design an informational sign onto the bench back.
3. Police commercial activities along the south bank of the river east of Jimmy Durante Blvd. to insure that dumping of waste into the river is discontinued.
4. Improve trail along the bank south of the river and east of Jimmy Durante Blvd. Post signs for pedestrian access.

Off-season use of the least tern nesting area for recreation would increase public recreational opportunities in close proximity to existing facilities and would not reduce the value of the area as nesting habitat. In fact off-season activities can provide a maintenance function by discouraging growth of vegetation which would harbor predators, and by churning up the substrate, making a better surface for tern nesting.

VEHICLE CIRCULATION

Several roadway improvements near the lagoon are being contemplated by the City to improve traffic flow and safety. These improvements are discussed here in terms of their relationship to lagoon resources. As improvements are initiated, the environmental review process for each project will identify adverse impacts and propose full mitigation before permits are issued.

The following proposed roadway improvements and related impacts are noted:

Grand Avenue. The only vehicle access to the lagoon is via Grand Avenue which is presently a dedicated roadway from San Dieguito Drive to the Del Mar City limits. In San Diego it becomes a private road providing access to the old airport site. The bridge across the river channel is in disrepair and the roadway has not been maintained for a number of years. The capacity of that roadway should not be expanded. However, it should be maintained to ensure that it will be adequate to provide emergency and maintenance access for the freshwater marsh and other habitat areas.

Jimmy Durante Bridge. This bridge south of the fairgrounds/racetrack complex was originally built in 1936. It suffered storm damage during the spring of 1979, and was repaired with

Federal Disaster Relief assistance. However, its condition remains substandard and plans are being prepared to replace it with Federal Aid for Urban Bridge Replacement funds.

Short-term impacts resulting from the construction activities will be mitigated insofar as is feasible. There should not be any additional significant long-term impacts since the new bridge will be essentially a replacement for the existing bridge.

San Dieguito Drive. The current paved surface for San Dieguito Drive, as narrow as 14 feet in some places, is already above capacity for the 31 existing homes on the hillside above and in Crest Canyon. A coastal permit issued for a private subdivision at the east end of San Dieguito Drive was conditioned upon the developer's funding of road improvements which may be required to serve the new development. Widening of the road to handle increased traffic should avoid any filling in the Fishhook channel area, since such filling would result in adverse impacts on the lagoon environment and destruction of some of the wildlife habitat along the channel bank. A full EIR will be required for approval of any road improvements and the project must include maximum mitigation of adverse impacts.

potential additional uses

In addition to the environmental enhancement work proposed for the lagoon, there are further developments which would meet broader community needs and/or which would not conflict with the primary goal of lagoon enhancement. Several lagoon-related uses have been proposed in the past and, although not now specifically included in the project design, could be developed at a later date (subject to full EIR and permit review). Appropriate uses could include a rare plant preserve, aquaculture facilities, a biological sewage treatment system, and a nature study center.

RARE PLANT PRESERVE

After completion of the enhancement features in the lagoon, it would be desirable to set aside various areas which can be used for transplanting and establishing rare coastal plants. Transplanting in the main lagoon should not occur until all site alterations are completed to ensure that these plants would not be disturbed and that their presence would not conflict with necessary site construction work.

An example of a plant which could be transplanted into such a preserve is the salt marsh daisy (Lasthenia glabrata coulteri). Although the plant

was formerly common in coastal salt marshes, it is rapidly disappearing from these localities. Salt flats provide the habitat required by this species.

After the land is under public management, the establishment of such preserves is dependent upon the willingness of the Department of Fish and Game to set aside land for this purpose, the availability of funds and the contribution of expertise from concerned scientists and citizens.

BIOLOGICAL SEWAGE TREATMENT SYSTEMS

It may be possible in the future to develop a biological system of wastewater treatment at San Dieguito Lagoon. The biological processing of sewage by marshes may be combined with aquaculture, as described below. Such joint use can be economically advantageous. It can also:

1. provide reclaimed wastewater for uses (such as lagoon flushing) that would otherwise contribute to the demand for new fresh water;
2. provide a low-energy method of waste processing; and
3. expand freshwater marsh areas (preferably upriver from lagoons).

There are several problems with such a process. There must be a large area available for a series of ponds which receive the progressively cleaner water. Possible odors could conflict with nearby human uses and mosquito control in a highly vegetated marsh is often a problem as well.

The San Diego Regional Water Quality Control Board maintains that past experience does not indicate all problems can be resolved. The current policy is to prohibit any sewage discharges into lagoons.

The State Water Resources Control Board generally favors a more flexible use of reclaimed sewage to enhance beneficial uses. In late 1978 the State Water Resources Control Board enacted Resolution No. 78-15, which asked the Regional Board to justify its water reclamation policies, especially in relation to the presently degraded status of many groundwater basins in the county. To date the Regional Board has indicated it is unwilling to change the standards. Until the issue is resolved, wastewater reclamation cannot be used to create new freshwater marshes nor to augment lagoon flushing.

AQUACULTURE

Aquaculture is the controlled production of organisms in a water system, which may be either an impoundment (usually humanmade) or an open body of water (usually a bay or estuary). Objectives of aquaculture are generally either food production or waste treatment.

Organisms produced in aquaculture systems include fish (catfish, mullet, etc.), invertebrates (clams, shrimp, lobsters, oysters, etc.), and plants (water hyacinth, algae, etc.). Culture of some of these organisms has been practiced successfully in the Orient and other parts of the world for many years. Catfish, trout and oyster culture have been commercially successful in limited locations in the United States, but culture of other species is still experimental. In general the technology is felt to be advancing but is not yet to the point where success is assured.

The use of aquaculture in San Dieguito Lagoon was suggested by the Cal Poly Coastal Design Group (1977), which made the following proposal:

"At the site of the former oxidation pond a combination aquaculture-wastewater treatment system would be established. The system would receive secondarily treated waste water ...[which] would then be biotically processed to tertiary quality...[The system] would serve the needs of aquaculture production...[and]

would allow the City of Del Mar to reclaim its wastewater for irrigation, for certain types of non-potable human uses, and most importantly, for a fresh water component of the lagoon...enhancing the lagoon's ecosystem while at the same time producing food...Revenues [from the system] ...might support continuing lagoon management and restoration. The...system would also give Del Mar the capability to meet future water quality standards by using economical natural processes rather than expensive technology...At the same time, these practices would serve as a model for wise and economically sound use of water resources."

Such a use in the lagoon would however, reduce the area available for native marine life and could also compete with bird usage. The project must be carefully designed to minimize impact on naturally occurring species.

There are potential sites for aquaculture and/or biological sewage processing facilities on the east side of Interstate 5, in an undeveloped portion of San Diego City. That area is a part of the historical lagoon and re-establishment of any wetlands for such uses appears to be desirable.

Development of an aquaculture facility at San Dieguito depends upon leadership by the private sector and/or educational institutions.

NATURE STUDY CENTER

The potential for a nature study center at a non-sensitive site near the lagoon was identified in the Cal Poly Pomona report, which advocated a low-profile, flood-proof, minimal structure which could be run by university groups doing research on the lagoon. Aquaculture was again mentioned as a possible function. The center could also be available for visitors and could be linked to a controlled trail system.

A possible model for a nature study center at San Dieguito Lagoon is found on South San Francisco Bay in the City of Palo Alto. The Lucy Evans Baylands Nature Interpretive Center is a unique public facility designed to harmonize with its environment. The Center was constructed by the City in 1969 at a cost of \$163,000. It is built on pilings at the fringe of a 120 acre salt marsh nature preserve and contains a lecture room, reading and exhibit areas, office, restrooms, laboratory and an exposed deck area. An elevated walkway has been built over the surrounding marshland. The Center is the focal point for environmental education programs conducted for school groups, Scouts, and the general public under the coordination of the City's Naturalist Staff.

The potential for such a center will be further reviewed during the preparation by Del Mar and the Conservancy of a work program for Phase One of the implementation plan.



chapter four

san dieguito lagoon plan implementation



This chapter presents the means and methodology to implement the site enhancement and design decisions listed in Chapter Three. Also integral to the implementation plan are Appendix A, "Recommended Actions for Public and Private Agencies", and Appendix B, "Phased Implementation of Site Construction Work". These are more detailed lists of concepts presented in this chapter. The end result of these actions will be the creation of an enhanced lagoon as represented graphically by the lagoon enhancement plan map at page 3-11.

Objectives

As stated in Chapter I, the program objectives include the securing of public ownership or control of the lands in the lagoon; identifying funding and management mechanisms to achieve the cost-effective and timely completion of site development work; and conducting adequate scientific monitoring of the resources and policing of human activities to protect the lagoon from adverse impacts.

High Costs of Wetland Restoration

As reviewed at page 4-23, the costs of wetland restoration are extremely high due to the need for using heavy earth moving equipment. Prior work of this kind which is applicable to west coast wetlands has been poorly documented, making it difficult to estimate costs precisely. In addition, the comparative effectiveness and costs of the various types of heavy equipment have been poorly documented, and the equipment recommendations made here may need to be revised as the work phase is approached.

A major economic and environmental constraint on wetland excavation work is the need to dispose properly of excavated soil ("spoils"). The cost of moving this soil to an acceptable location, when added to the cost of excavation, can be prohibitive. Environmental constraints exercised by Environmental Protection Agency and State Water Resources Control Board over ocean disposal are rigorous and the cost of dredge movement of the spoils to an approved dumping site is very high.

Presently it appears that most or all of the spoils problem can be resolved by making the soil available to the 22nd District Agricultural Association for its fairgrounds improvements program, now in the planning stages. This opportunity has been integrated into the implementation plan described in this chapter and in Appendices A and B.

The methodology and constraints of soil excavation are described further in the consultant's report.

Cost Savings

Various cost-savings have been suggested throughout this chapter, including the following:

1. the use of personnel from the California Conservation Corps, whose labor is provided to public agencies at no cost to the agency;
2. solicitation of contributions of some materials from the private sector;
3. development of a state wetlands program including acquisition of equipment needed for wetland excavation and maintenance work;

4. minimization of the use of suction dredgers (although the costs of earth moving are low once the dredger is on-site, the costs of mobilization and of handling fluid spoils are very high); and
5. the phasing of construction work for maximum efficiencies related to site opportunities and constraints.

Toward A State Wetlands Enhancement Program

The final costs of implementing this program (as well as others like it) and the degree of success it achieves, will depend largely upon whether the State of California is willing or able to initiate a comprehensive wetlands preservation and enhancement program. Such an effort would have to include the acquisition of sufficient heavy earth moving and dredging equipment for both the initial work and the ongoing maintenance that is required to control infilling by sedimentation. Until this occurs the high costs of commercial contracts for each project will continue to be an obstacle to wetlands preservation.

Phasing

To permit the necessary flexibility in implementing the plan, it is proposed that the enhancement work be carried out in a series of phases (which are keyed to land ownership, type of resource enhancement need, availability of funds, type of equipment to be used and the lead agency). Phased implementation will allow adequate preparation for each enhancement activity and realization of potential cost savings. As each phase is initiated by the lead agency, the costs should be recalculated to reflect increases due to inflation, new information on the state-of-the-art, and the analysis in the engineering bids received (each firm will have its own preferred equipment, methodology, and profit margin). This process will permit "fine-tuning" of the plan as it progresses.

The purpose and components of each phase are reviewed in detail in this chapter and in Appendix B.

To introduce the concept, the following summary is provided:

Phase One - Minor Channel Improvements, habitat enhancement, and public involvement (lead agency, City of Del Mar).

Phase Two - Northern tidal basin construction (lead agency, DFG).

Phase Three - Freshwater marsh construction (lead agency, City of Del Mar).

Phase Four - Southern tidal basin construction (lead agency, DFG).

Phase Five - Uplands habitat enhancement (lead agency, DFG).

Phase Six - Flood channel dredging (lead agencies, City of Del Mar and U.S. Soil Conservation Service or Army Corps of Engineers).

agency responsibilities

Agency Roles

The four agencies which should be primarily responsible for the successful implementation of this project are: the State Coastal Conservancy, the City of Del Mar, the Department of Fish and Game, (DFG) and the Wildlife Conservation Board (WCB).

STATE COASTAL CONSERVANCY

Conservancy assistance is needed to ensure that several phases of the project are implemented in a timely fashion. Especially important is the Conservancy's ability to coordinate the activities of the many agencies involved to ensure that their planning, funding and permit review activities are consistent with the lagoon enhancement plan. Further, the Conservancy can assist the City of Del Mar and DFG in developing a monitoring program to ascertain the effectiveness of various enhancement activities, such as the establishment of a least tern nesting reserve area.

The Conservancy will also have a major role with Del Mar in guiding Phases One and Three to a successful conclusion. Also, in coordination with the Wildlife Conservation Board, the Conservancy will examine and develop multiple funding sources (see Page 4-23) for implementation of Phases Two and Four by the Department of Fish and Game.

Conservancy funding assistance to the City of Del Mar is immediately needed to fund the initial program start-up costs (\$10,000) and to fund site improvements for Phase One (\$59,800), including \$1,800 for the least tern preserve fence; \$11,000 for equipment rental; \$17,000 for a culvert to create the tidal marsh at Area IV; and \$30,000 for earth moving at that site.

CITY OF DEL MAR

In addition to being the co-planner of the enhancement program with the Conservancy, Del Mar must ensure that its police powers (expressed through the LCP portion of this plan and the supporting development regulations) adequately protect the lagoon resources. The City is the lead agency for Phases One, Three, and Six. With DFG (through a cooperative agreement described in this section) it will be involved in the ongoing management of the lagoon. In addition the City will have ownership of at least 26 acres in the lagoon area.

WILDLIFE CONSERVATION BOARD

It is recommended that the Wildlife Conservation Board be responsible for the acquisition of 216 acres of land necessary to complete the ecological reserve, as funds become available. In coordination with the Conservancy, the WCB should ensure that Phases Two and Four are adequately funded.

These recommendations are made with the recognition that a commitment by the Wildlife Conservation Board would only be made at one of its public meetings after a specific project is presented. The Board's decision would be based on detailed engineering and cost

estimates and an evaluation of wildlife and public benefits, including the cost effectiveness of the proposal.

DEPARTMENT OF FISH AND GAME

Through a cooperative agreement, DFG would assume primary responsibility for management of the lagoon ecological reserve after public acquisition is completed. It would be the lead agency for Phases Two, Four, and Five.

OTHER AGENCIES

The California Conservation Corps can play a substantial role in completing Phase One. The CCC can provide the labor and record-keeping for an ongoing lagoon mouth opening program (to be carried out on an intermittent or emergency basis as directed by DFG or Del Mar).

Many other agencies also have key roles. The U.S. Fish and Wildlife Service has provided valuable technical advice and will have an important role in reviewing "Section 404" applications (see page 4-11).

The opportunity exists for the private sector to create a citizens trust or foundation for ongoing management of the lagoon.

A total of 56 actions by 15 agencies are proposed to secure implementation of this program (see Appendix A).

Cooperative Agreements

To ensure that the implementation and management program moves ahead, at least four agreements must be executed.

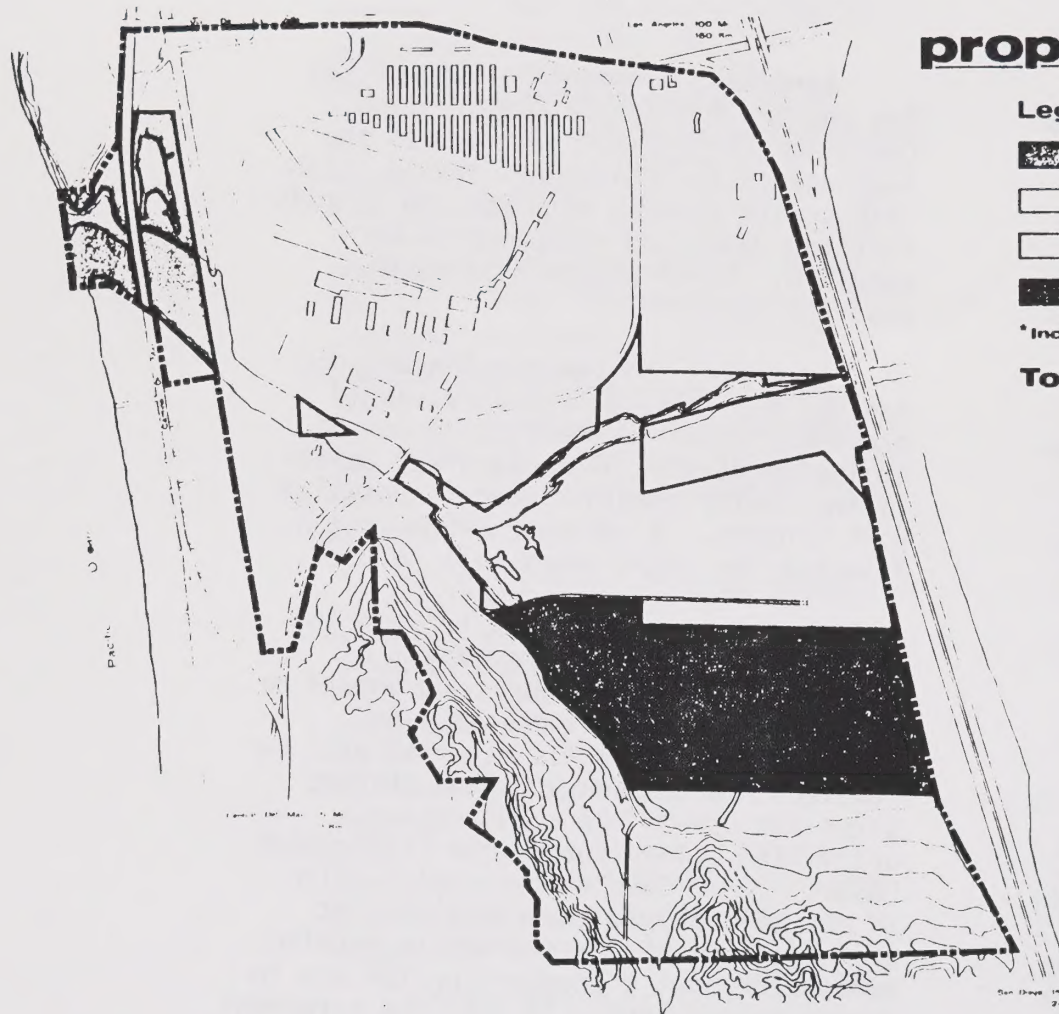
Cooperative agreement between Del Mar and the Department of Fish and Game. This agreement should establish a cooperative maintenance and monitoring arrangement for the lagoon. The agreement will be based on understanding that when the balance of the lagoon has been purchased by the Wildlife Conservation Board, The Department of Fish and Game will recommend that the Fish and Game Commission designate the area, including lands owned by the City of Del Mar, an "ecological reserve" pursuant to the terms of the Fish and Game Code, Sections 1580-1584.

This designation will establish enough proprietary interest in the lagoon lands to permit DFG to expend its funds in maintenance and restoration activities. The agreement should also clarify the frequency of visits by Fish and Game Wardens and the County Sheriff, the frequency of trash cleanup, and the availability of equipment to be used in on-going maintenance (including intermittent emergency lagoon mouth opening).

Agreement between the City of Del Mar and the California Conservation Corps for Phase One. Del Mar, as the lead agency for Phase One, should establish a work program with CCC and clarify starting dates and equipment to be supplied. Other phases will require separate agreements.

Agreement between the Conservancy and Del Mar. The Conservancy should provide a grant to the City to assist in implementation of Phase One. Jointly the staffs should prepare a detailed work program. A contract should establish how the grant money will be used.

Cooperative Agreement between the 22nd District and the Department of Fish and Game. This agreement should be negotiated as soon as possible to clarify how much spoils material will be removed from temporary lagoon storage sites for use in the construction activities called for in the Fairgrounds Master Plan. The "bargain sale" price of the soil should be established at this time, if DFG is enabled to receive money from such a transaction for use in lagoon enhancement. If not, the agreement should establish in-kind services that the 22nd District can provide in exchange for the soil. Management of the overflow parking lot as a least tern preserve should also be included.



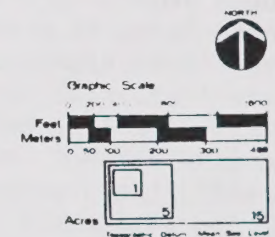
proposed acquisitions

Legend

-  Scripps Clinic & Research (23.4)*
-  Philip Jefferson (3.2)*
-  Del Mar 88 (101.7)*
-  Cameron Mostaghi (87.7)

*Includes Public Trust Lands

Total Acres: 216*



san dieguito lagoon enhancement plan

City of Del Mar, California • State Coastal Conservancy

proposed acquisitions

ARRANGEMENTS WITH PRIVATE OWNERS

A large proportion of the land in the lagoon is currently in private ownership. In order to conduct enhancement work, it is essential that 220 acres described below, be placed in the ownership or control of a resource-oriented public agency. A preliminary estimate places the cost of this land at about \$1.5 million.

It should be noted that the value of any proposed acquisitions will be established by an appraisal. The citing of this figure does not constitute a commitment to purchase any land at this or any other price.

Scripps Clinic and Research Foundation (Area 11)

This property includes 23.4 acres on both sides of Camino del Mar west of the railroad. This area provides visual and pedestrian access along the river to the ocean, and offers vital nesting and feeding habitat for the Belding's Savannah sparrow and other water associated birds including the California least tern.

Most of the property is covered by tidal ponds on the main river channel, and probably is subject to Public Trust and/or prescriptive rights of access. Public ownership would insure protection of the existing habitat value and facilitate control of the area for maintenance of the tidal flow in the river. This area would be affected by Phase One of the enhancement project.

"Del Mar 88" (Area IX)

This property is held by an investment partnership. The area totals 101.7 acres, including tidal lands which may be subject to the public trust and/or owned by the state. The majority of the property lies south of the main river channel and east of the Fishhook, with a 12-acre portion north of the river. The property has not been formally appraised, but the Wildlife Conservation Board has expressed interest in its acquisition. Acquisition or dedication is required for implementation of Phase Two, construction of the north tidal basin, and Phase Five, uplands habitat restoration.

Moshtaghi (Area X)

The entire southern portion of the lagoon consists of 87.7 areas which may belong to the Moshtaghi, a private developer. The San Diego Coast Regional Commission has granted Moshtaghi permission to develop an additional 40 acres south of the lagoon on the condition that the lagoon property be sold to the state at the appraised fair market value or placed in a permanent open space easement. The Wildlife Conservation Board is negotiating with Moshtaghi to acquire the lagoon land. Public acquisition of this property is essential for the implementation of Phase Four, construction of the south tidal basin.

Railroad Triangle (Area IV)

This 3.5-acre parcel of railroad right-of-way lies east of the main railroad line and south of the west channel of the river. Its south edge is bordered by the dike that once supported a second spur which provided turnaround capabilities for the railroad. Dedication, lease or sale of the property by AT&SF Railway Co. to the City of Del Mar or the Department of Fish and Game must be accomplished in order to implement the construction of the tidal basin proposed in Phase One of this program.

Jefferson (Area III-A)

This 2.9-acre parcel lies almost entirely under water in the channel between Jimmy Durante Blvd. and the railroad. While it is claimed to be privately owned, it may be subject to Public Trust and has no recognized development potential. The City should encourage dedication of this parcel to simplify dredging and maintenance of the river channel and to relieve the owner of maintenance and liability problems.

ARRANGEMENTS WITH PUBLIC OWNERS

22nd District Agricultural Association (Area VI)

The 16-acre overflow parking lot for the racetrack/fairgrounds complex is proposed to be part of a land exchange after the "Del Mar 88" property is in public management. Twelve acres north of the river channel would be offered for parking to replace the land to be used as a least tern preserve.

City of San Diego (Area VIII)

This 14-acre area was previously used by the City of Del Mar as a sewage oxidation pond. It is owned by the City of San Diego, with the City of Del Mar having an option to lease which is renewed annually. Del Mar will exercise its option as Phase Three nears implementation.

permits and approvals

To carry out this program, it will be necessary to secure local, state and federal permits for the proposed enhancement work. Local permits will come from the City of Del Mar and the City of San Diego. The process for securing state and federal permits for each implementation phase is described below.

Phase One (minor channel modification for water circulation). Del Mar as lead agency will submit an application to the U.S. Army Corps of Engineers to secure the Section 10/404. (for alterations of a waterway or wetland) as required by the Clean Water Act. This permit will allow the California Conservation Corps to clear sediment and debris from small channels in Areas II, IX-A and X. Del Mar will also request a "Streambed Alteration Agreement" from DFG for the same work, pursuant to Sections 1601-1603 of the Fish and Game Code.

The State Lands Commission will be asked to determine if work in the waterways can be considered to be for maintenance only, thereby not requiring Commission approval.

Del Mar will also request a "Section 10" permit (for work affecting a navigable waterway) from the Army Corps of Engineers if the railroad triangle basin has been acquired for conversion into a tidal salt marsh. The permit is needed for installation of the pipe which will connect the basin to the river.

Before any work is initiated, Del Mar will submit to the Regional Clearinghouse a "negative declaration" in accordance with the California Environmental Quality Act, stating that the Phase One land modification work will not have a significant adverse impact on the environment.

Phase Two (construction of northern tidal basin and a channel connecting it to the river channel). The Department of Fish and Game as lead agency will be responsible for securing Sections 10 and 404 permits from the Army Corps of Engineers. The Department will circulate a "focused environmental impact report" (based on this plan and limited to significant impacts only) prior to the authorization of any actions.

Phase Three (construction of a freshwater marsh). Del Mar, as the lead agency (with the Conservancy's assistance) will complete the design work for the windmill-driven water pumping system and prepare a "focused EIR" addressing such issues as groundwater supply water aeration control, mosquito management and nutrient residue in the abandoned sewage pond. Del Mar will determine if the State Water Resources Control Board requires any conditions on the extraction of 70 acre-feet of water from the river during a period of high runoff.

Phase Four (construction of the southern tidal basin). The process of obtaining permits for this phase is the same as for Phase Two, with DFG again acting as the lead agency.

Phase Five (improvement of upland habitat). This phase, involving revegetation of disturbed areas by DFG, requires no permit or CEQA review.

CHART OF AGENCY PERMITS AND REVIEWS REQUIRED.

FEDERAL GOVERNMENT		
AGENCY	AUTHORITY	DESCRIPTION
U.S. Army Corps of Engineers (COE)	Section 404, Clean Water Act	Strongest wetlands preservation law. Reviews placement of fill in wetlands and disposal of dredge spoils.
COE	Section 10, River & Harbors Act of 1899	Controls obstructions in navigable waterways. Administrative process is integrated with the 404 permits.
U.S. Fish & Wildlife Service (FWS)	Fish & Wildlife Coordination Act; Endangered Species Act	Comments on COE Section 10 and 404 permits for impact on wildlife. Can influence allocation of federal funds for projects affecting endangered species.
Environmental Protection Agency (EPA)/(RWQCB)	Section 402, Clean Water Act	Permit for water quality control ("National Pollution Discharge Elimination System"). Administered by RWQCB; reviewed by EPA and SWRCB.
ALL	National Environmental Policy Act	Impact assessment must be conducted by federal agencies before projects are begun.

ase Six (flood channel dredging).

The City of Del Mar will be the lead agency but the project will require the funding and planning support of the U.S. Soil Conservation Service or the Army Corps of Engineers. With a cooperative project, the Section 404 permits for dredging would be expedited, provided the issue of spoils disposal can be resolved.

STATE OF CALIFORNIA*		
AGENCY	AUTHORITY	DESCRIPTION
Regional Water Quality Control Board (RWQCB)	Section 402, Clean Water Act	Review to ensure waterways excavation does not cause unnecessary and avoidable pollution. SWRCB, EPA and FWS have strong review roles.
Dept. of Fish & Game (DFG)	Section 1601-1603, Fish & Game Code	Streambed Alteration Agreement. Review to protect ecological values; involves mitigation agreement.
DFG	Section 5653, Fish & Game Code	Controls suction dredging.
State Lands Commission	Articles for Admission of California to the Union, 1850	Determine state-owned tideland; finding of consistency for "Doctrine of Public Trust" which provides an easement over waterways to MHHW and wetlands. Any use of state-owned lands requires lease or permit.
State Coastal Commission	Coastal Act of 1976	Reviews Program for consistency. Finding of consistency for Conservancy project. Certifies LCP for Del Mar.
San Diego Coast Regional Commission	Coastal Act of 1976	Reviews permit application for Coastal Act and LCP consistency for all development activities including restoration. Certifies LCP for Del Mar.
LOCAL GOVERNMENT*		
AGENCY	AUTHORITY	DESCRIPTION
San Diego County Health Department		Review and comment on vector control. Can enter land at will to control nuisances.
City of Del Mar	Development regulations	Local police power is the base of land use regulation. All development activities in the floodway require a Conditional Use Permit.

* All state and local agencies must also conform to the requirements of the California Environmental Quality Act (CEQA).

Site construction and improvements

To initiate this project as soon as possible, it is proposed that it be implemented in six phases which have been defined to reflect the following considerations:

1. Different funding sources will have to be applied to different elements of the enhancement work. Elements for which funding is readily available are proposed for early implementation.
2. Much of the proposed enhancement work cannot be undertaken until the land is under public ownership or control. Work that does not require land ownership transfers is included in the first phase of implementation. Each later phase is designed so that it can be carried out as soon as the land becomes available.
3. The various elements of the proposed enhancement work differ in their equipment requirements. Elements requiring little or no construction equipment are proposed for early implementation; later phases require successively heavier equipment and are designed so that equipment usage can be coordinated.
4. The various elements of the enhancement work differ in their environmental documentation requirements under the California Environmental Quality Act. In general, the implementation phases are designed so that those activities requiring the least documentation are phased earlier than those requiring more elaborate documentation.
5. Because of the number of proposed enhancement actions and the variety of constraints on implementing all of these actions, it is quite possible that some actions will not occur in the order planned. To allow flexibility in implementing the enhancement plan, each phase is designed to be relatively independent of the other phases.

The phasing approach is especially desirable because of the untested nature of some components of this project. Careful evaluation of the benefits and consequences of each phase should occur before the next phase is begun. Occasionally there may be need for modifications and fine-tuning, due to improvements in the state-of-the-art or new information on marsh enhancement.

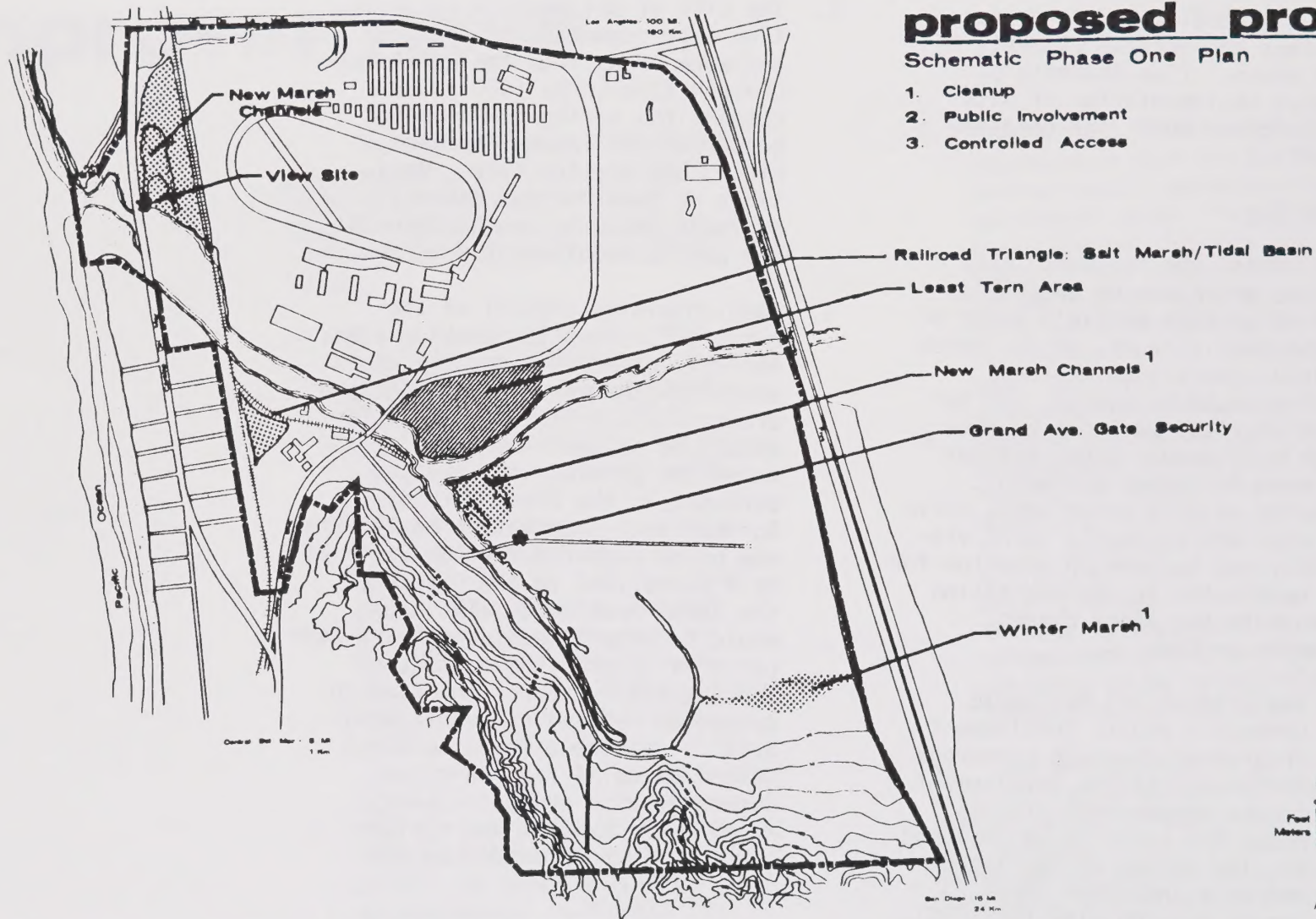
The following discussion outlines the various elements of each phase. (See Appendix B, "Phased Implementation of Site Construction Work" for complete details.)

Phase One

Phase One includes those actions which can be undertaken on land already publicly owned or in the public trust, or for which minimal acquisition or lease funding would be needed, and for which physical work can be done largely by manual labor without the need for heavy equipment. Elements in this phase would serve to build the project's local visibility and to develop momentum for the completion of implementation actions in the other phases. Elements include:

1. The City of Del Mar would conduct a public involvement program which would encourage continued citizen involvement in the enhancement process. Among the tasks to be included are the design of the lagoon entrance and kiosk (Area V), lagoon viewing site (Area II), and information signs for the lagoon reserve; the solicitation of donations of materials and services for other actions under Phase I; and the organization of a Spring 1980 clean-up of litter, waterway snags, and safety hazards.

2. The City of Del Mar, in cooperation with community volunteers and work crews from the California Conservation Corps (CCC), would conduct the spring clean-up and construct the lagoon entrance, kiosk, and viewing site. Donations of construction materials or funds would be sought through the public involvement program.
3. Upon obtaining control of the racetrack's overflow parking area, the City of Del Mar and DFG would establish the area as a least tern preserve (Area VI). The transfer should be accomplished, and an alternative parking site located, pursuant to the 22nd District Agricultural Association Master Plan now being prepared for the District by a consultant to the Office of the State Architect. The area would be established as a least tern preserve by erecting protecting fencing and by depositing sand to encourage nesting by least terns. Sand is available from the Crest Canyon alluvial fan, which was deposited as a result of heavy rains over the past two winters. Labor would be provided by the CCC.
4. Following State Lands Commission findings of public trust the City of Del Mar using CCC work crews, would undertake the minor channel and water circulation improvements at three sites:



¹ Requires land acquisition or Public Trust determination

san dieguito lagoon enhancement plan

City of Del Mar, California • State Coastal Conservancy

the marsh and pond area just east of the Camino del Mar bridge (Area II), the marsh at the channel fork (Area IX-B), and the winter marsh area (Area X-C).

5. Following the negotiation of a lease or acquisition of the AT&SF Railway Co. property (Area IV), the City of Del Mar and work crews from the CCC and DFG would restore the area as a tidal basin. Site work would include excavation and installation of a pipe connecting the new marsh to the west channel.
6. The City of Del Mar will establish controlled access trails, lagoon viewing sites, and educational signs at appropriate locations (see map, page 3-16).

Phase Two

Phase Two includes the construction of the northern tidal basin and nesting island (Areas IX-A and D), which would be possible upon public ownership of the 101.7-acre Del Mar 88 property. This phase would require some heavy equipment such as trucks, a swamp cat and possibly a dragline.

Tasks would include the reconstruction of levees and excavation of a channel connecting the tidal basin with the south channel, and creation and enhancement of a least tern nesting island.

Phase Three

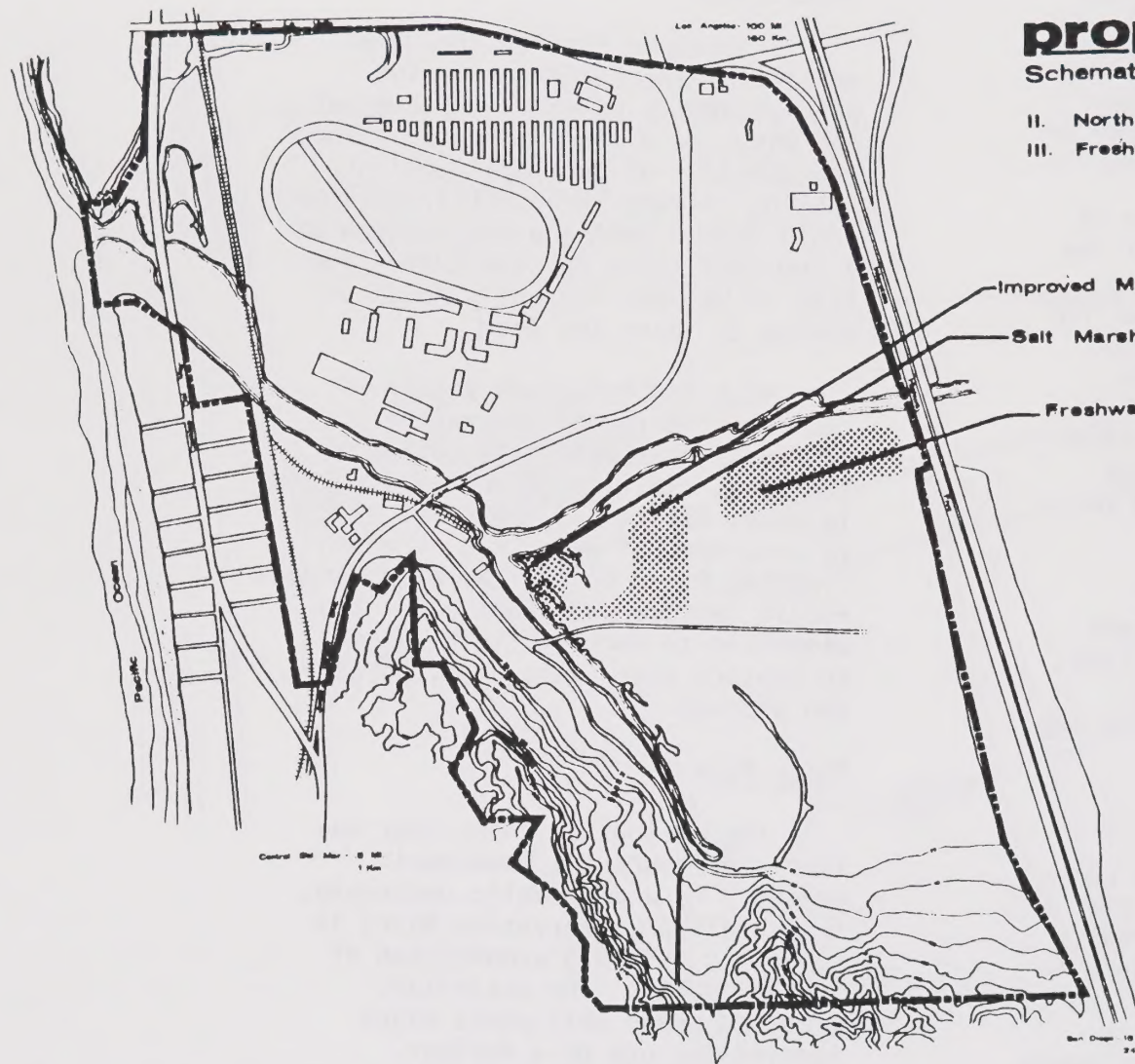
This phase involves the conversion of the sewage oxidation pond presently owned by the City of San Diego to a freshwater marsh and the creation of two additional bird nesting islands (Area VIII). Action would depend upon the negotiation of a low-cost lease for the site. The City of Del Mar currently holds an option to lease the pond.

Work tasks include repair of levees, clearing of vegetation and sludge deposits from the bottom of the pond, creation of two bird nesting islands, filling of the marsh with 70 acre-feet of water from the San Dieguito River during the high winter runoff period, and erection of two windmills to pump in fresh water to replace water loss by evaporation and seepage.

Phase Four

The actions in Phase Four may take place once the Moshtaghi property is under public ownership. The Wildlife Conservation Board is currently pursuing acquisition of this property. The activities proposed under this phase might involve the use of a dredger.

This phase includes the development of the southern tidal basin and mudflats, the creation of a least tern nesting island, the deepening and widening of the south channel south of Grand Avenue, and the widening and extension of the Fish-hook channel (Areas X-A and C).



proposed project

Schematic Phase Two & Three Plan

- II. North Tidal Basin Development
- III. Freshwater Marsh Development

Improved Marsh Water Circulation (II)

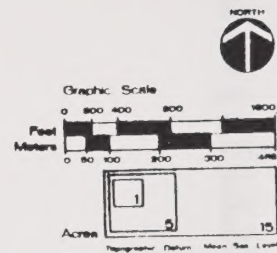
Salt Marsh (II)

Freshwater Marsh (III)

san dieguito lagoon enhancement plan

City of Del Mar, California • State Coastal Conservancy

South Tidal Basin Development



City of Del Mar, California • State Social Conservancy



Phase Five

Phase Five involves the cleanup and removal of debris from upland areas (primarily Areas IX and X) and revegetation with native species, and also the establishment of a small preserve for rare dune plants (Area I). These activities would be carried out by DFG pursuant to its regular management duties once the land is under public ownership.

Phase Six

Included in Phase VI is the dredging of the main channel of the San Dieguito River and the northern portion of the south channel (to the Grand Avenue bridge) to reduce flood hazards and to enhance the lagoon's tidal flushing capability.

monitoring, maintenance and policing

Because of the interrelated concerns of many agencies and the public, it is recommended that a task force be established; meeting monthly to coordinate various implementation and management activities needed to enhance the lagoon. It is proposed that this task force be made up of representatives of the Cities of San Diego and Del Mar, San Dieguito Lagoon citizens advisory committee, Conservancy, Department of Fish and Game, Coastal Commission, U.S. Fish and Wildlife Service, and California Conservation Corps.

Monitoring

Closely related to the phasing of lagoon enhancement work is the conduct of ongoing monitoring of the lagoon's biological and hydrological condition. Monitoring is especially important because of the need to determine if each phase of the enhancement work has been successful enough to permit the next step to be taken.

A monitoring program for the San Dieguito Lagoon could follow the example of that proposed in the Conservancy's Arcata Marsh Plan (1979), with some modifications, as discussed below.

Monitoring in the San Dieguito Lagoon would assess the effects of enhancement procedures on physical and biotic conditions in the lagoon. It would also determine the critical time for opening the lagoon entrance (during periods of closure) to permit continued existence of the fauna and flora, and it would identify those rare occasions when the tide may be so high that it threatens the interior of the lagoon and its wildlife.

The monitoring program would include the sampling of physical environmental information and the sampling of biological populations. Initially, physical data (e.g. on water chemistry) should be collected simultaneously with biological data and correlations between the two attempted. An eventual goal might be the prediction of faunal and floral conditions from water chemistry data, which would avoid the need for and expense of regular biological sampling.

Approximate tolerance levels for physical factors in different groups of animals are known and can serve as a starting point for further lagoon faunal studies. The following physical data should be regularly recorded: B.O.D. (biological or biochemical oxygen demand), D.O. (dissolved oxygen),

pH, suspended solids, nitro-
(nitrate, ammonia), phosphorus
(total phosphate, orthophosphate),
salinity, heavy metals, chlorinated
hydrocarbons, precipitation, wind
speed, temperature, water circula-
tion, and sedimentation rates and
deposits.

Biological data which should
be collected simultaneously include:
counts of public health indicator
organisms (e.g., *E. coli*) benthic
invertebrates, fish and birds, and
measurements of algal growth and the
growth of macrophytes in newly
created or newly planted areas.

In general, numbers of species
and individuals (or biomass) in the
lagoon should be determined or
estimated for each group. Productiv-
ity estimates for each would also be
useful. The exact information co-
llected and methods for these studies
should be reviewed by professional
biologists, prior to the commence-
ment of a monitoring program.

Maintenance

A variety of maintenance duties
by the City of Del Mar and the Depart-
ment of Fish and Game may be required.
These include:

1. Opening of lagoon mouth on an
intermittent or emergency basis;
2. Closing of lagoon mouth when high
tides threaten interior;
3. Culvert inspection to avoid
clogging;
4. Debris removal from ponds and
channels;

5. Fence lock checks and repair
vandalized areas;
6. Island maintenance;
7. Checks of monitoring devices;
8. Mosquito control;
9. Pump maintenance at the oxidation
pond;
10. Revegetation: maintain nursery
areas, transplant at appropriate
times;
11. Vegetation control: remove emer-
gent plants (cattails) as necess-
ary in freshwater marsh; and
12. Water level manipulation in fresh-
water pond to control mosquitos,
and eutrophication.

Policing

Policing against trespass and
domestic animal intrusion will be
necessary to protect the habitat and
natural values of the lagoon. The
frequency of policing activities will
depend on the actual usage of proposed
accessways in the area.

Private Sector Assistance

As mentioned above, a citizens'
trust or foundation could provide much
assistance in monitoring and maintaining
the lagoon, which would reduce public
costs. This potential will be examined
by Del Mar and the Conservancy during
Phase One.

costs and funding

The cost of wetland restoration programs is high (e.g. Arcata freshwater marsh, 60 acres - \$230,000; San Elijo Lagoon East Basin, 200 acres - \$800,000). The San Dieguito Lagoon project, in all of its components including land acquisition, could require the expenditure of several million dollars. However, with the phasing concept and with the achievement of proposed economy measures (see page 4-3), the cost can be substantially reduced.

Cost estimation has been especially difficult due to the absence of adequate documentation on the comparative benefits and constraints of the different types of heavy earth-moving equipment. While State and Federal agencies have worked with wetland-mobile equipment, there are no analyses of lessons learned and no recommendations on cost-saving techniques or equipment to be used for special purposes. Even commercial cost estimates for the simplest bulldozer work are highly variable (different estimates for moving a cubic yard in Area IV were \$1.75, \$3.00, and \$5.00). Therefore, for planning purposes, the following base figures were used to approximate the cost of each portion of the project:

1. Use of bulldozer, swampcat, dragline and skiploader: \$2.00 a cubic yard for movement of the soil to a nearby deposit pile with later pick up and loading into a truck (for a direct load into truck, due to delays, add 50¢ a cubic yard). This estimate does not include cost of road construction for truck access.
2. Use of a suction dredge: \$1.00 a cubic yard, which includes piping the fluid spoils one-half mile. This estimate does not reflect the mobilization cost (for a 16" dredge, \$80,000 to \$100,000; for a 12" dredge, \$25,000 to \$30,000) or the cost of building a levee to hold the fluidized soil while it dries (which can be 2 to 3 years).

These assumptions are the basis of the cost analysis which follows.

Costs

The implementation of the enhancement plan is expected to cost approximately \$2.3 million. Acquisition costs (based on a preliminary planning estimate) are expected to be about \$1.5 million for 220 acres of land. Public trust interests which must be determined by the State Lands Commission may exist over a portion of these properties.

Site improvement costs for all elements of the enhancement plan could total within the range of \$750,000 to \$900,000 if let to private contractors. Cost-saving measures, including the use of state-owned heavy equipment and crews, are possible and have been identified above.

The estimated costs of each phase, and the most appropriate funding sources, are summarized below. A detailed discussion of the funding sources follows.

Phase One. Approximately \$70,000 for administration and construction of various site improvements, to be funded by a grant from the State Coastal Conservancy to the City of Del Mar, plus substantial in-kind services, especially from the California Conservation corps (in the form of contributed labor). The cost breakdown is as follows:

- 1, Least tern preserve (Area VI fence: \$1,800;
2. Preserve equipment rental: \$11,000;
3. Excavation of eastern tidal basin (Area IV): \$30,000;
4. Placement of tidal pipe: \$17,000;
5. Administration: \$10,000

The first four items are contingent upon placement of the respective parcels under public management for the stated purposes. The site work in this phase may also be funded by the California Environmental Protection Program.

Phase Two. About \$200,000 for the northern tidal basin construction (Area IX-C). The DFG should submit a request for funding to the State Wildlife Conservation Board and to the U. S. Heritage Conservation and Recreation Service (for funds from the Land and Water Conservation Fund).

Phase Three. \$17,200 for the placement of windmills in the fresh-water marsh and \$5,000 for excavation (unless excavation equipment is contributed or borrowed from concurrent work at other sites). The California Environmental Protection Program is a likely funding source for this phase.

Phase Four. From \$270,000 to \$425,000 (depending on equipment used) for construction of the southern tidal basin and new channel configurations (Area X). Funding should be sought from the same sources as in Phase Two.

Phase Five. An undetermined amount for upland habitat enhancement and establishment of a sand dunes plant preserve. Costs should be covered by DFG administrative funds.

Phase Six. About \$250,000 for flood control dredging of the main river channel and part of the south channel to be sought by the City of Del Mar from the U.S. Soil Conservation Service as a flood control portion (requiring no local share) of PL566 "Small Watershed Project" or from the Army Corps of Engineers for a small flood control project.

Staffing Commitments

It is estimated that the following commitments of public agency staff time (totaling two person-years annually) are necessary for implementation of this program:

Del Mar Lagoon Coordinator. One-half time will be required for a member of the City's Planning and Community Development Staff. (An alternative would be an arrangement with Sea Grant funding to place a University scientist on contract with the City.)

Law Enforcement. At least until DFG assumes the major management role, the City of Del Mar should ensure that its contract with the County Sheriff's Department establishes a daily check of the Grand Avenue bridge gate and an in-car visual inspection of the lagoon. The Fire Station near Jimmy Durante bridge could assist in visual monitoring.

Department of Fish and Game personnel. Until the cooperative agreement is executed and new duties established, one to two work days per month will be needed for monitoring and coordination activities (including the monthly meeting). A Fish and Game Warden should make daily visits, unless other arrangements are made with the City. In addition, DFG should be responsible for the scientific monitoring and water sampling program which requires at least monthly execution. (Again, an arrangement with Sea Grant could enable a University scientist to do this work on contract with the City or DFG.)

State Coastal Conservancy staff time. After execution of the Phase One contract and work program, one to two work weeks per month will be needed to monitor progress through Phase One and preparation for Phase Two (including a monthly meeting of all concerned agencies). The Conservancy should continue its supporting and coordinating role as long as its funds are being used in site improvements. In the early phases, it should also assist interested persons in establishing a citizens trust or foundation to participate in lagoon management (see page 4-5).

California Conservation Corps labor. In addition to the substantial work to be conducted by the CCC during Phase One, and possibly in later phases as well, the project coordinator for the Escondido camp should attend the monthly meetings, especially if the CCC assumes an on-going role in emergency lagoon mouth opening.

Funding

The primary sources for funds to implement the acquisition and enhancement for this project are:

State of California Coastal Conservancy. Because the Conservancy's budget is for the most part from a one-time bond act share, its capability to purchase land is limited. Moreover, the Conservancy can only fund 40% of any acquisition for an enhancement project. The Conservancy has flexibility to fund site improvements but not to support on-going management and maintenance. The Conservancy should provide a grant of \$70,000 to the City of Del Mar to implement Phase One of this project. With the Wildlife Conservation Board, the Conservancy would develop funding for implementation of Phases Two and Four of this project.

State of California Wildlife Conservation Board. Land acquisition of all major parcels should be accomplished by this agency. With its annual funds from the State's share of the racetrack revenues, it is in the best

position of all State agencies to secure areas for preservation and enhancement. Lands acquired by WCB would be managed by the Department of Fish and Game after the area is established as an "Ecological Reserve".

Some constraints exist on WCB regarding site development work. For the most part its funds can be used to complete structural facilities that directly benefit wildlife or recreational uses involving wildlife, but there are constraints on using these funds for land movement and dredging activities. Funds for enhancement can only be spent on lands owned by the State or, if owned by a local public agency, under the coverage of a cooperative agreement between the DFG and the local jurisdiction.

California Environmental Protection Program. This program is administered by the Secretary for Resources. The source of Program funds is the sale of personalized license plates and the funds are therefore annually replenished. They are chiefly used to implement small environmental protection projects that have high visibility and can be quickly implemented.

Funding for the least tern reserve (Area VI) and construction of the western tidal basin (Area IV), both of which are in Phase One, has been applied for by the Conservancy, as has the cost of the windmills in Phase Three.

Land and Water Conservation Fund. This fund is administered by the U. S. Recreation and Heritage Conservation Service and the State Department of Parks and Recreation. It is primarily used for the acquisition and development of recreational areas. This fund could be a source for the construction of a nature study center at a future time.

In such an effort, the 50% matching funds would be supplied by the City of Del Mar. The availability of this source for any enhancement work (other than such small components as the native plant preserves, which have an educational/viewing value) is unlikely.

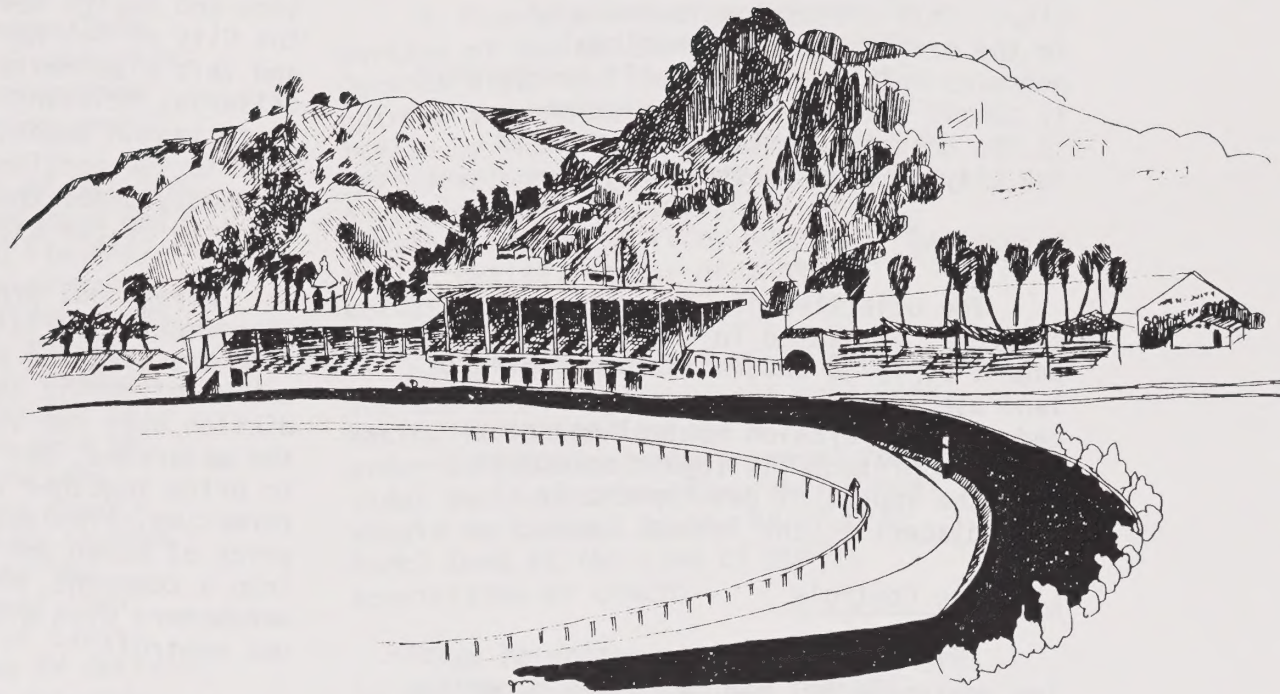
Small Watershed Act (PL566). This program is administered by the Soil Conservation Service and is for planning, acquisition, and development for better management of watersheds under 250,000 acres in size. Dredging of the flood channel and related activities could qualify for 100% funding from this source. The lead time for review is substantial, i.e., three to four years.

Small Flood Control Project Funds. The Corps of Engineers can undertake small flood control projects (costing the Corps less than \$2 million) without the specific authorization of Congress. Such projects must be complete in themselves, resolve the problem, and not require further Federal expenditures. A 50% sharing of costs is generally required. The lead time is one to three years.

U. S. Environmental Protection Agency/State Water Resources Control Board. The well-being of the San Dieguito River watershed is of great importance to the long range enhancement of the lagoon. Environmental Protection Agency and State Water Resources Control Board could apply Section 208 planning funds from the Clean Water Act to prepare erosion and sedimentation control strategies.

In-kind services. Also of major importance to implementing the lagoon plan is the availability of in-kind or contributed services from concerned agencies and the public. Phase One of the program largely relies on this level of activity, especially with labor supplied by the California Conservation Corps.

CONFIDENTIAL



san dieguito lagoon land use regulations

introduction

This chapter presents the land use regulations (zoning, grading and erosion control ordinances and design review criteria) which the City of Del Mar is proposing to apply to developments in and adjacent to the lagoon. Further refinement of these regulations is currently being undertaken by the City. This discussion is included in the program for informational purposes only. The City will independently submit the proposed regulations to the Coastal Commission as part of the City's Local Coastal Program.

Objectives

The objective of land use controls, as stated in Chapter One, page 1-6, is to ensure that appropriate land use and structural design controls and adequate erosion control measures exist to protect the lagoon resources from the impact of development in and adjacent to the lagoon.

Land Use Controls

This plan assumes retention of existing zoning in Del Mar, with the exception of the "railroad triangle", and proposes extending appropriate zoning to the areas within the City of San Diego and the county jurisdiction.

Design criteria and development controls should be applied to a buffer area surrounding the lagoon to protect

the ecological reserve from the impacts of activities taking place in adjacent areas. These controls should focus on water quality and sedimentation problems which may result from development activities, and the visual impact of structures and landscaping in the lagoon viewshed. Land Conservation and Design Review ordinances for the City of Del Mar address these impacts and this plan reiterates the established criteria, relating them specifically to lagoon impacts and extending them to the portion of the buffer area currently under the jurisdiction of the City of San Diego.

A regional program for watershed management is critical to the long term preservation of the lagoon. A number of public agencies hold jurisdiction over the various portions of the watershed, but an effort is needed to bring together the volumes of information, previous plans, and the array of human and natural processes into a coherent, focused watershed management plan with adequate land use controls.

The 22nd District Agricultural Association is currently preparing a revised Master Plan which must be compatible with this enhancement program and, when certified by the Coastal Commission, will be incorporated into the LCP for the City of Del Mar. The preparation of the Master Plan has been coordinated with this planning effort and both projects should be mutually supporting.

zoning

City of Del Mar

Review of present zoning in Del Mar indicates that existing controls are adequate for the most part to protect the lagoon from incompatible uses. The chart on page 5-5 summarizes the zoning categories for properties located in the lagoon planning area.

Within the city limits of Del Mar, the lagoon area between Turf Road and San Dieguito Drive is zoned Floodway (FW) to prevent any uses which would restrict or be damaged by flood flows. West of Jimmy Durante Blvd. the FW zone includes the main river channel and banks and spreads out at the railroad to cover the low areas west to the ocean. The FW Zone coincides essentially with the current County designation. If indicated by studies currently being conducted by the Department of Water Resources (DWR) and the County Department of Sanitation and Flood Control, the FW designation should be adjusted to coincide with a new floodway determined by those studies.

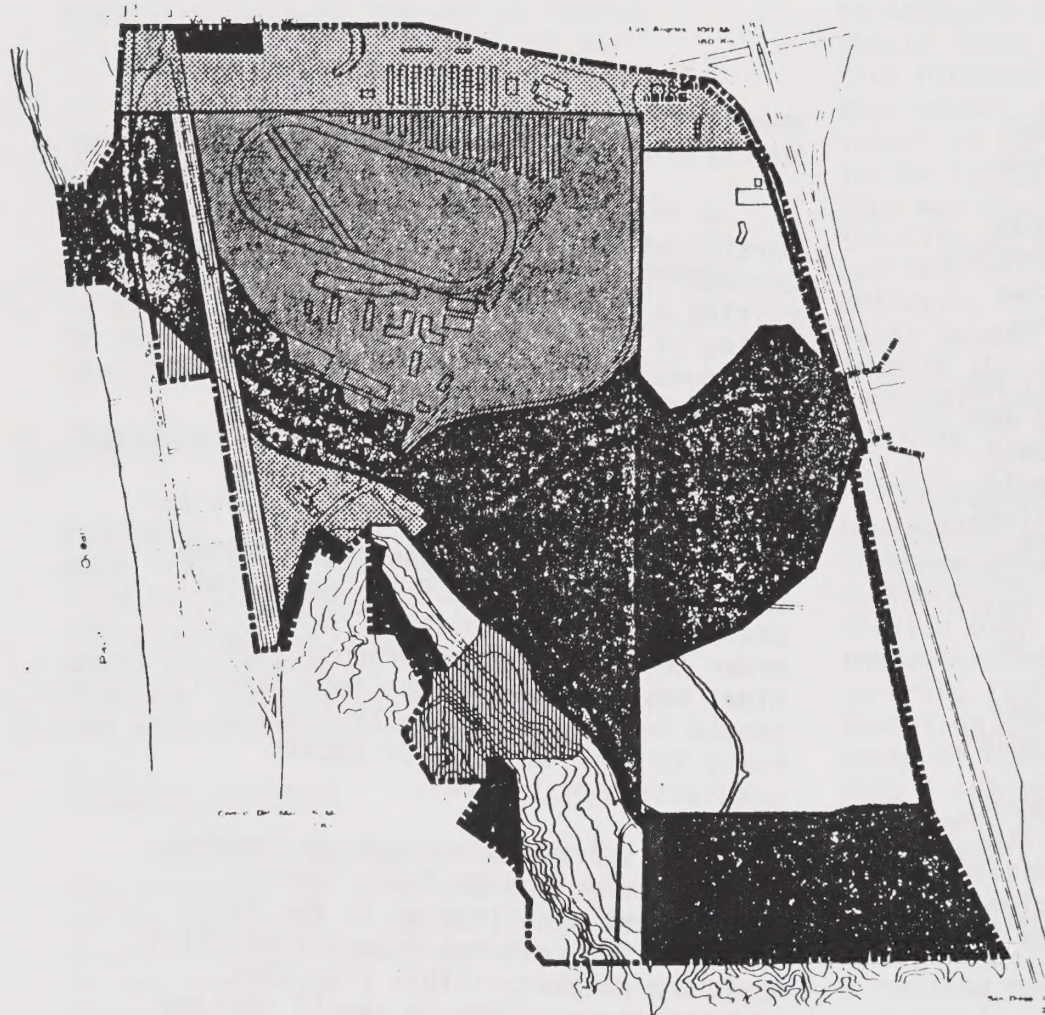
The south side of the river on both sides of Jimmy Durante Blvd. is designated North Commercial (NC) allowing low intensity commercial uses which provide a service to the community, "offering a lively open air commercial environment with substantial

open space", as stated in the City's Zoning Ordinance.

A floodplain overlay covers the portion of the NC Zone between Jimmy Durante Blvd. and the railroad, requiring a Conditional Use Permit and review by the City Engineer to assure that development will not constitute an obstruction to flood flow, nor create a hazard to life, property or public health, safety or general welfare.

The "railroad triangle", proposed for the construction of the west tidal basin, is located in the NC Zone. In order to implement the proposal for tidal basin construction, this parcel should be changed to the PP (Public Park) Zone at the time of public acquisition or control.

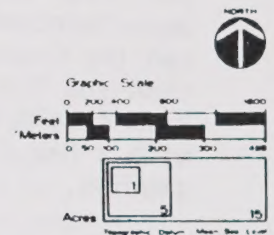
The fairgrounds/racetrack complex is covered by the FR Zone, leaving development decisions up to the 22nd District Agricultural Association which owns the property. This Plan does not propose a change in the FR designation, but does find that recreation-oriented uses in that zone shall be limited to those proposed in the 22nd District Master Plan, as certified by the Coastal Commission in the City of Del Mar's LCP.



zoning / floodlines

Legend

-  Floodway
-  Fairgrounds / Racetrack
-  Commercial
-  Agricultural (A-1-10)
-  Med. Density Resid. (R-1-10)
-  " " Mixed (RM)
-  Low " Resid. (R-1-20)
-  Very Low Dens. Res. (R-1-40)
-  Railroad
-  Open Space Overlay
-  Floodplain Fringe



san dieguito lagoon enhancement plan

City of Del Mar, California · State Coastal Conservancy

The lagoon viewshed west of San Dieguito Drive facing the river valley to the southeast is zoned R1-40, appropriately allowing one unit per acre of residential development. The Bluff, Slope and Canyon (BSC) Overlay seeks to preserve the scenic sandstone bluffs and canyons and steep slopes which characterize the area, while at the same time protecting the public from unsafe development. Clustering of structures is encouraged in the BSC Overlay Zone in order to minimize the visual impact of development on the surrounding area. The City's Land Conservation Ordinance sets forth criteria and requires a discretionary permit for any grading proposed in the City. The Buffer Area standards identified in this plan reiterate design and grading controls on development for the specific purpose of protecting the lagoon resources. Such controls apply to the hillside as well as other privately owned parcels surrounding the lagoon.

The 20-acre "Snakewall" property on the hillside is covered by an Open Space Overlay, as well as the BSC Overlay. The site possesses significant scenic values, and could be appropriately developed as an overnight visitor facility such as a youth hostel or a professional retreat. If that were to occur, a change from the R1-40 Zoning would be required and should be considered at the time of any project application. However, the intensity of development currently allowed should not be exceeded.

ZONING DESIGNATIONS

City of Del Mar	
Zone	Description
FW	Floodway designation for areas subject to relatively deep and high velocity floodwater; prohibits uses which would impede the flow of floodwaters; requires conditional Use Permit for <u>any</u> uses. Allows aviaries, field and seed crops; aquaculture and mariculture operations; or open recreational. Prohibits permanent structures.
PP	Public Parkland; for publicly owned land designated for use as a public park or open space preserve; and land which is subject to the Public Trust. Allows public parks and playgrounds, public openspaces, and ecological preserves; requires Planning Commission review.
FR	Fairgrounds-Racetrack; allows commercial recreation uses on property owned by the State of California 22nd District Agricultural Association.
NC	North Commercial Zone allows commercial activities that provide a service to the community; development shall be of low intensity and profile, offering a lively open air commercial environment with substantial open space; allows retailing of goods, dispensing of services, and light manufacturing (exclusive of drive-thru).
R-10 R-40	Residential uses, one dwelling per 10,000 or 40,000 square feet respectively.
Overlay	Description
FP	Floodplain; includes the 100-year floodplain area, except the portion within the actual floodway.
BSC	Bluff, Slope and Canyon; provide special regulations for control of development to preserve the scenic sandstone bluffs and related canyons and steep slopes.
OS	Open Space; established to protect open space areas of community wide importance. Applies development criteria to specific parcels to preserve scenic vistas and unique natural features and to ensure an atmosphere of openness. (See Del Mar Community Plan for specific parcel criteria.)

City of San Diego

A major proposal for simplifying management of the lagoon involves annexation of the City of San Diego land west of Interstate 5. Recommendations for zone changes presented here should be carried out as part of the annexation process or, in the event that annexation does not take place, as part of the City of San Diego's LCP implementation.

The commercial-recreation area south of Via de la Valle should be retained in the current C (commercial) zoning. This will allow continued visitor uses compatible with the adjacent fairgrounds/racetrack complex.

South of this area, the 22nd District land between Turf Road and Interstate 5, is zoned A1-10 for agricultural uses, allowing one dwelling per ten acres for agricultural use. This area should be changed to the FR Zone to permit only uses related to the recreational facilities at the racetrack.

The FW (Floodway) Zone in San Diego coincides with the County's designation of the floodway with adequate development restrictions to prevent life and property loss. This zone would not change unless new County flood studies determine that flood lines should be redrawn.

The area south of the floodway to the bottom of the southern hillside slope is also currently zoned A1-10 for agricultural use. The Torrey Pines Community Plan of the City of San Diego proposes an Open Space designation for the area. As soon as public acquisition is completed, this land should be rezoned to the PP Zone designation to permit implementation of the various phases of enhancement work described in this Plan.

In the event that public acquisition is not completed, the A1-10 Zone should be retained and land uses limited to apiaries, aviaries; field and seed crops, and aquaculture, with a minimum parcel size not less than ten acres.

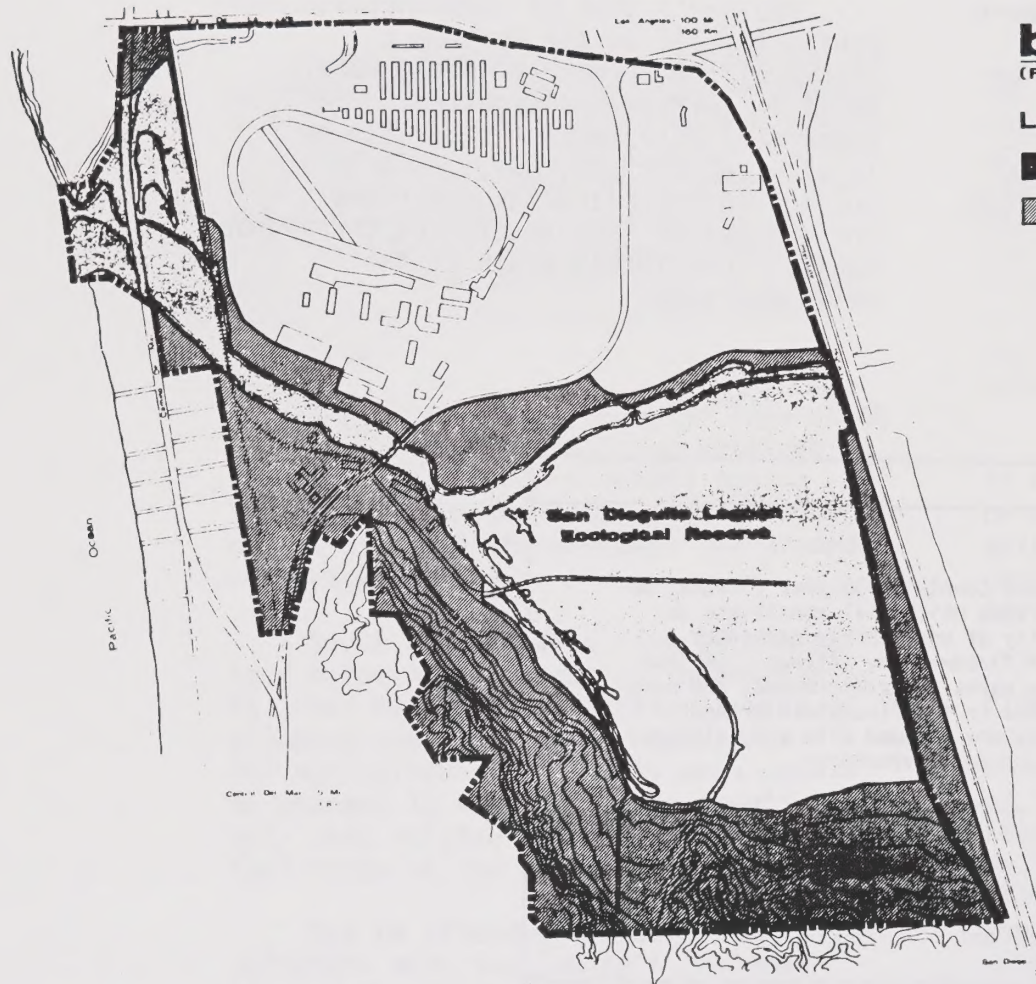
The residential zoning on the hillside south of the lagoon should be changed to reduce the overall residential density currently permitted to a lower density of two acres per unit, consistent with recent coastal development permit decisions. The buffer area development criteria should be applied to the area with controls that will protect the scenic values, insure that unsafe development will not occur, and encourage clustering of development to reduce impacts on the lagoon.

County of San Diego

The strip of land along the northern border of the fairgrounds/racetrack complex is zoned A70-8 by the County for light agricultural use. Again, this designation should be changed to permit only recreation area uses designated in the 22nd District's certified Master Plan.

The small area of residential zoning (RV-11) at the northwest corner of the racetrack should remain as it is currently designated. The Commercial Zone west of the railroad is also appropriate, but should be subject to the standards described for the Buffer Area to protect the lagoon habitat immediately south of the developed area.

City of San Diego	
<u>Zone</u>	<u>Description</u>
FW	Floodway coincides with the County's 100-year floodway designation. Permits only uses which will constitute an unreasonably, unnecessarily or undesirably dangerous impediment to the flow of floodwaters. Allows: various agricultural uses; public parks and playgrounds; and parking lots serving facilities in the floodplain fringe. Other relatively open uses are allowed with a conditional use permit. Restricts permanent structures.
C	Commercial uses, include restaurants, gas stations, recreational vehicle park.
A1-10	Agricultural use; 10 acre minimum lot size.
R1-20	Medium density residential use.
County of San Diego	
<u>Zone</u>	<u>Description</u>
C	Commercial uses.
A70-8	Agricultural use; 8 acre minimum lot size; usually applied in flood prone areas.
RV-11	Residential use, allows triplexes; minimum 4,000 square feet of land per dwelling unit.

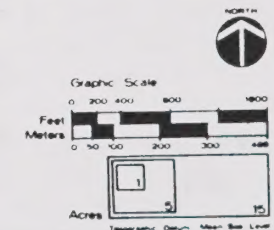


buffer areas

(Proposed)

Legend

- Reserve Lands
- Buffer Areas



san dieguito lagoon enhancement plan

City of Del Mar, California · State Coastal Conservancy

supplemental controls

As part of the land use regulations, the City of Del Mar should immediately designate the lagoon as an "Ecological Reserve" and identify the surrounding area as a Buffer Area with development criteria outlined below to be applied to it.

The ecological reserve status serves to identify the area which this plan seeks to enhance, and which will ultimately come under the management of the Department of Fish and Game pursuant to their definition in the Fish and Game code.

The Buffer Area surrounding the "Ecological Reserve" is designated to protect the Reserve from the impact of existing facilities and new development activities in immediately adjacent areas. After completion of Del Mar's LCP, Section 30603 of the 1976 Coastal Act states that any permit for development activities taking place within 100 feet of the wetland can be appealed to the State Commission. This plan establishes objectives and criteria for review of applications within the designated Buffer Area, which includes but is not limited to that 100 foot zone. Specific objectives of the Buffer Area designation include but is not limited to:

- 1) preservation of the habitat values of the reserve;
- 2) protection of the water quality in the reserve;
- 3) preservation of the visual resource values of the lagoon and its viewshed; and
- 4) protection of the coastal bluffs.

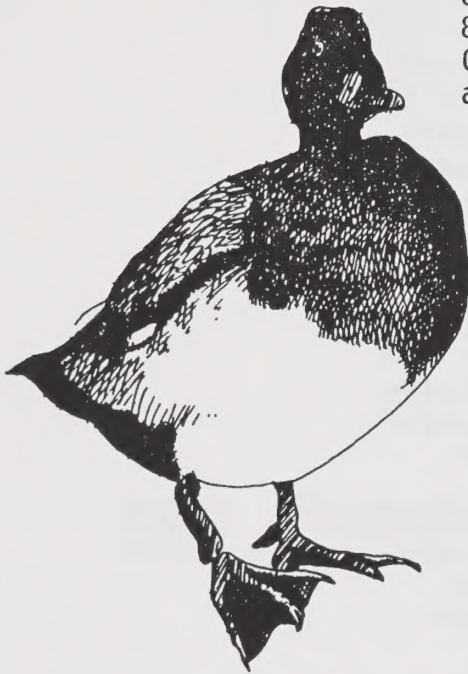
AREA

The Buffer Area covers the slope on the south and southwest edges of the Ecological Reserve, from the boundary of the Reserve up to the north boundary of the Crest Canyon Park Preserve on the south, and to the top of the hillside on the southwest. On the south side of the main river channel, the Buffer Area covers all of the property within the study area south of the river bank between Jimmy Durante Blvd. and Camino del Mar except the "railroad triangle" which is designated a part of the reserve itself.

North of the river channel, the Buffer Area covers the portion of land between the north bank of the river and the structures of the fairground/racetrack complex or its parking area.

PROTECTION STANDARDS FOR THE ECOLOGICAL RESERVE

In order to ensure the protection of the Reserve, and to ensure that potential development results in minimum disturbance of existing or natural terrain and vegetation and does not create soil erosion, silting of lower slopes, slide damage, flooding problems, or severe cutting or scarring, all grading which takes place in the designated Buffer Area shall conform to the criteria set forth in Section 87.212 of the Del Mar Municipal Code (Land Conservation Ordinance) as follows:



"The alteration should result in a minimum disturbance of existing or natural terrain, natural formation, and major vegetation.

- a. Development should be subservient to the topography of the site rather than forcing the topography to be subservient to the development.
- b. Development shall ensure that steep slopes are not endangered by undue increases in weight or retained water to avoid slippage of steep banks;
- c. Development shall avoid any alteration of natural formations; Restoration of the natural site shall be encouraged;
- d. Development shall minimize the loss of vegetation;
- e. Development shall not create major interruptions of natural drainage patterns."

If the grading is to occur within the jurisdiction of the City of Del Mar, a Land Conservation Permit shall be obtained from the City.

All activities and development taking place in the Buffer Area shall conform to these further standards:

- a. Ensure that all runoff during new construction is retained on site in settling ponds or is percolated into the soil on site; or construct a runoff culvert to the lowlands with an adequate energy dissipator to prevent erosion and sedimentation into the lagoon;
- b. Ensure that drainage from existing developed areas causes no erosion or sedimentation into the lagoon;
- c. Ensure that runoff from existing developed areas does not carry toxins or excess nutrients into the lagoon channels;
- d. Ensure that all on-site drainage patterns will occur on or through areas designed to serve this function;
- e. Minimize the disruption of existing natural features such as trees, and other vegetation, natural ground forms, and view;
- f. Blend any proposed grading with the contours of adjacent properties;

- g. Retain the maximum amount of native vegetation on the site and insure that all vegetation is done with natives, minimizing the need for irrigation;
- h. Ensure that the value of the viewshed is protected by incorporating the following criteria into the design of new developments:
 - 1). Compatibility of design with the desired developing character of the surrounding area.
 - 2). Recognition of views, climate and the nature of outside activities in the design of exterior spaces.
 - 3). Preservation of views and scenic vistas from unreasonable encroachment.
 - 4). In areas of rugged topography, design of buildings to be subservient to the natural terrain.
 - 5). Consideration of views from the lagoon and the freeway corridor in the landscape and structure design.

Watershed management

THE NEED

Watershed management is an essential part of wetland preservation.

Wetlands are geologically transitory natural phenomena (see Appendix D) due to continuing infilling by the process of watershed erosion. Eroded materials become streamborne sediments, ultimately being deposited in river deltas and wetlands where the water current is too slow to continue carrying the soil particles. If left to natural processes alone, this "transitory" period is long. Indeed, it is human alteration of and construction on the hills and valleys of the watershed that accelerates the downstream movement of soil. Erosion from development of the watershed is a threat to the coastal lagoon that can ultimately negate all of the public investments in the tidal wetlands through sedimentation.

The City of San Diego has initiated a study of the San Dieguito River which should aid in the process of implementing the goals and objectives of Del Mar's Local Coastal Program and the Lagoon Plan, the Coastal Act of 1976 and other plans.

THE SAN DIEGUITO WATERSHED

Briefly, the lower San Dieguito River Watershed reaches from Del Mar to Interstate 15 where the highway crosses the eastern end of Lake Hodges south of Escondido, encompassing all those lands west of Interstate 15 with tributaries draining into the San Dieguito River. The total land of this lower watershed is about 43 square miles.

The entire watershed including the portion above Lake Hodges covers about 350 square miles and represents approximately nine percent of San Diego County. The construction of Hodges and Sutherland Reservoirs have essentially divided the watershed into discrete units which interact only during years of heavy rainfall which causes the reservoirs to spill over their dams. This has occurred only twice in the last 26 years. The upstream area is a highly scenic and valuable wildlife habitat area but is undergoing heavy development pressure (e.g. the "North City West" proposal for a 40,000 increase in population).

OBJECTIVES AND METHODOLOGY

No outstanding example of a watershed management program exists in California, although some components are becoming clearer. These are summarized below:

1. Control of erosion and the resulting sedimentation is the primary purpose and goal of watershed management. Reduction of speed and quantity of runoff water is a primary tool.
2. Increased sedimentation from careless construction practices seriously damages streams. Construction can increase soil erosion by removing vegetation which stabilizes soil with its roots, leaves, and organic debris; and by removing topsoil, changing natural drainage patterns, and leaving large expanses of bare land exposed to wind and running water. The amount of sediment eroded from areas undergoing urban development can be far greater than from any other major land use. Urbanization can produce 20 to 200 times as much sediment as farmland does. In site preparation, barren soils should be rapidly stabilized and revegetation and runoff detention implemented.

Grades should be designed to produce runoff equal to the natural flow and to direct flows along natural drainage courses and through natural terrain where the vegetation can cleanse and filter runoff waters. Paved surfaces should cover a minimal area, to allow rapid and sufficient water infiltration into the soil. The flow can be diverted through natural vegetated drainageways and by use of suitable buffer strips which provide for the cleansing of runoff water by providing vegetative "scrubbing" and infiltration of water through the soil.

3. Significant amounts of land may be required for buffer strips, runoff detention areas, groundwater recharge areas, and other water protection measures. However, creative use of such areas for recreation, decorative purposes, or privacy screens will permit uses of benefit to the owners.
4. The higher the degree of development, the greater the need to provide vegetated buffer along drainageways. Riparian vegetation provides a highly vital and diverse wildlife habitat and acts to retard erosion from steambanks.

5. Farm operations in the watershed must be well managed to protect coastal ecosystems from damage by fertilizers, biocides, sedimentation, and altered runoff. Croplands and areas intensively used by livestock should be set back from watercourses to provide a naturally vegetated buffer area. Upland farm layout should minimize alteration of natural drainage and prevent water pollution.
6. Paved surfaces collect and channelize a broad variety of pollutants which are a major source of water quality problems.
7. Uplands around marshes may require seeding and planting to develop a permanent vegetation cover, provide upland nesting cover, and prevent wind and water erosion with resulting sediment deposition in the wetland.

Appropriate agencies should incorporate these concepts into all plans, projects and regulations.



8. Secure agreement with the railroad for use of triangle park and/or initiate acquisition proceedings.

2. PROPOSED ACTIONS FOR THE 22ND DISTRICT AGRICULTURAL ASSOCIATION

- a. Ensure that the Racetrack Master Plan is fully compatible with the Coastal Act, the Del Mar LCP, and this Lagoon Enhancement Program;
- b. Lease or contribute 12 to 15.9 acres within the supplemental parking area (Area VI) to the City of Del Mar or DFG for management as a least tern habitat preserve.
- c. Assist the City of Del Mar in conducting soil core analyses at soil extraction areas. If suitable, receive maximum possible amount of spoils from the lagoon for use in the construction phases of the Master Plan and share in costs by purchasing the soil at below-market price.
- d. Conduct a cleanup and beautification effort along the edges of the lagoon, including removal of rubble along water edges. Maintain these areas free of such accumulations in the future.
- e. Develop with DFG, SCC, and Del Mar a cooperative agreement regarding the Least Tern area and the disposition of excavated soil within the race track construction areas and on Area VII.

- ### 3. PROPOSED ACTIONS FOR THE CITY OF SAN DIEGO

- a. Endorse the San Diego Lagoon Enhancement Plan by resolution of the City Council.
- b. Ensure that the pilot watershed/erosion control plan and program for the San Diego River basin below Hodges Dam fully protects the lagoon from controllable sedimentation.
- c. Accelerate completion and implementation of the Crest Canyon erosion control plan with the assurance that further sedimentation into the lagoon will be halted by modification measures (e.g., a culvert leading to an energy dissipator and sediment basin at the foot of Crest Canyon).
- d. Authorize annexation to the City of Del Mar of all San Diego City land west of Interstate 5, north of San Diego Drive, and south of Via de la Valle.

- a. Endorse the San Dieguito Lagoon Enhancement Plan by resolution of the Board of Supervisors.
- b. Cooperate in the City of San Diego's pilot watershed erosion plan and program for the San Dieguito River basin below Hodges Dam.
- c. Authorize annexation to the City of Del Mar of all unincorporated land to the north of the existing Del Mar City limits between Turf Road and Camino del Mar up to Via de la Valle.

- a. Endorse the plan in concept, submit the Enhancement Plan (Chapter III) to Coastal Commission for approval, and then authorize implementation of Phase One with a grant to Del Mar of up to \$10,000 for administration of work and monitoring plus \$60,000 for construction of site improvements in Phase One.
- b. Authorize staff to assist the City's lagoon project coordinator as needed to ensure timely implementation of all phases. Prepare work program for Phase One with Del Mar.
- c. Coordinate multiple actions necessary to implement the program and establish a lagoon monitoring and maintenance effort.

- a. Find that the Coastal Conservancy's San Dieguito Lagoon Resource Enhancement Plan (Chapter III of this document) is consistent with the Coastal Act of 1976.
- b. Approve the lagoon regulatory provisions in the Del Mar LCP (based on the proposals in Chapter V of this document) and ensure that no major development occurs in the area of annexation until the process has been completed and Del Mar or San Diego has established appropriate zoning for these areas.

- c. If new permits or modifications for permits in Area IX are needed, ensure that conditions applied to the present permit are maintained, including:
 - i. Mitigation of impacts of widening San Dieguito Drive; sale of lagoon bottom land at appraised value to WCB;
 - j. buffering of the lagoon from human and domestic animal intrusion along the north boundary of development.
7. PROPOSED ACTIONS FOR THE DEPARTMENT OF FISH AND GAME AND THE STATE WILDLIFE CONSERVATION BOARD
 - a. Endorse this Lagoon Enhancement Program through a letter from the DFG Director with clarification of what DFG funding is available.
 - b. Issue Section 1601-1603 streambed alteration agreements for Phase One channel work.
 - c. Expedite lagoon land acquisition by WCB to permit the initiation of Phases Two and Four in a timely fashion.
 - d. After land acquisition and prior to solicitation of bids for the engineering work, determine what DFG equipment and personnel would be made available to work on the projects. Determine if new equipment should be purchased.
 - e. Execute a cooperative agreement with the City of Del Mar for management of the lagoon.
 - f. Jointly with the Coastal Conservancy, prepare an analysis of the comparative costs, constraints and advantages of heavy equipment used in wetland and waterway work to permit a timely implementation of Phases Two and Four when the land is acquired.
 - g. Upon purchase of the coastal dunes at the mouth of the river, set aside appropriate acreage for a dunes natural vegetation preserve (with assistance from the CCC).
 - h. Develop with Del Mar, the CCC and/or University scientists, a procedure for determining when a closed lagoon mouth requires manual openings and if high tide levels require emergency closing of the mouth.
8. PROPOSED ACTIONS FOR THE CALIFORNIA CONSERVATION CORPS (CCC)
 - a. Endorse the plan as a long-term joint implementation project with the Conservancy and Del Mar.
 - b. Schedule adequate personnel from the Escondido Camp to assist the City of Del Mar in implementing Phase One in early spring 1980, with work to include these activities:
 1. Hazard and rubble removal from public lands and waterways.
 2. Deepen channels in Area II to improve tidal flushing and reduce human intrusion.
 3. Assist in removing sand from the Crest Canyon alluvial fan (Area XII) for covering the least term habitat (Area VI).
 4. Improve existing channel through Area X-C for winter rain water runoff and unrestrained ponding (if land is acquired).
 5. Improve existing channels within marsh in Area IX-B without alteration of Salicornia. Place sand on existing barren salt flat sites and contour into nesting islands.
 6. Construct a lagoon viewing station and mini-park next to the Highway 101 Bridge with contributed materials.
 - c. Through an agreement with DFG, Del Mar, and any advising University scientists, establish an experimental program for manual (or with a contributed tractor) opening of the lagoon mouth within one week after it is decided the marine environment is in jeopardy. With specialists' guidance, maintain records of the frequency of this work, time needed, duration of open mouth, and ecological results.
9. PROPOSED ACTIONS FOR THE STATE LANDS COMMISSION AND DIVISION
 - a. Endorse the Lagoon Enhancement Program in concept and authorize improvements (as "maintenance" work not requiring specific permits) of the public waterways for all phases of the project.
 - b. Determine if Area IX-A (marshy area at the juncture of the North Channel and the South Channel) is State land and available for near-future improvements by the CCC, as part of Phase One.
 - c. Accelerate public lands and Public Trust determinations.

10. STATE WATER QUALITY CONTROL BOARD AND REGIONAL WATER QUALITY CONTROL BOARD
 - a. Authorize Phase One channel work through a NPDES permit.
 - b. Authorize freshwater marsh filling (Phase III) through a SWRCB approval to appropriate water.
11. PROPOSED ACTIONS FOR FEDERAL AGENCIES
 - a. Corps of Engineers
 1. Issue a Section 10/404 permit for the Phase One channel modification work to be conducted by the California Conservation Corps in conjunction with the State Coastal Conservancy and the City of Del Mar.
 2. Closely monitor the timely solution of the Crest Canyon sedimentation fan situation to correct the "unauthorized fill" within a waterway.
 3. Review the overall project phasing and advise Del Mar and the Conservancy about any concerns over Section 10/404 permits.
 4. Determine if Phase Six (river floodway dredging) qualifies as a small flood control project.
 - b. U.S. Fish and Wildlife Service
 1. Support issuance of Section 10/404 permits for Phase One channel modifications on the finding that the manual excavations of presently stagnant and shallow channels in the Salicornia marsh of Area IX-B and Area X-C will be beneficial.
 - c. Soil Conservation Service

Determine if Phase Six (river floodway dredging) would qualify as a PL 566 "Small Watershed Project" and facilitate application for funds by the City of Del Mar.
12. PROPOSED ACTIONS FOR EDUCATIONAL INSTITUTIONS AND THE PRIVATE SECTOR
 - a. University of San Diego and University of California at San Diego
 1. Share with DFG and Del Mar the ongoing monitoring of biological productivity and water quality in the lagoon, with special emphasis on determining when prompt action is needed to open the lagoon mouth. (any sampling, other than with live cages, must receive Del Mar City Council approval until a DFG - City cooperative agreement establishes other means of approval or practices.)
 2. Jointly with citizen public interest groups, and Del Mar - DFG concurrence, sponsor guided tours of the lagoon as project phases are implemented, to promote understanding of the ecological significance of, and need for, physical alterations to the channels and the overall lagoon's processes.
 - b. Public Interest Groups
 1. Work with educational institutions to conduct educational tours and conduct resource monitoring, as proposed above, as well as to improve policing of the lagoon.
 2. Develop a "San Diego Lagoon and Wetlands Trust" (similar to the San Elijo Lagoon Foundation) which can purchase lands, accept dedications, and provide management services in coordination with the appropriate governmental agencies.

APPENDIX B

PHASED IMPLEMENTATION OF SITE CONSTRUCTION WORK

1. Introduction

The following section is a detailed outline of the many work activities necessary to create the project design proposed in Chapter III. The sequence of phases may be altered but reasons exist for their chronological progression, as noted in Chapter IV.

The description has been organized into an outline and list format to facilitate cross - reference and comparison. Its sections are: Objective; Location; Lead Agency; Prior Actions Needed; Estimated Cost (the estimated cost of land acquisitions have not been provided to avoid future complications of negotiations); Equipment (which now seems the most probable or suitable for the nature of work); Tasks (those actions needed to achieve the work objective); Concerns (problems, issues, constraints); Environmental Impact (and mitigation); Fiscal Impact (the cost to the public and possible reductions).

2. PHASE ONE: Remedial Actions, Habitat Improvement and Public Involvement

a. Overview

This phase is designed to permit some of the enhancement work to be initiated quickly, even before all the land is acquired by the Wildlife Conservation Board (WCB). Although some channel work in public trust areas will require a Section 10/404 permit from the Army Corps of Engineers (COE), most of the work will not require such a review. The City of Del Mar is the lead agency and will be supported in most of the components with advice and assistance from the California Department of Fish and Game (DFG); and assistance (grants and in-lieu contributions) from the State Coastal Conservancy (SCC) and the California Conservation Corps (CCC). The components of this phase are: public involvement program; least tern habitat enhancement; minor channel and water circulation improvements; cleanup of waste; construction of permanent entrance to lagoon reserve and information kiosks; and improvement of controlled access and recreation.

b. PUBLIC INVOLVEMENT PROGRAM

Objective: Provide public education about values of the lagoon. encourage private sector contributions of materials.

Lead Agency: Del Mar and its citizens' committee.

Location: Not applicable, except in certain sites for special projects.

Prior Actions Needed: Appointment of Del Mar Coordinator; award of Conservancy grant to the City for administration.

Estimated Cost: In-kind services (City of Del Mar staff time and citizen contributions of time and materials).

Equipment: Not applicable

- ° Tasks:
 - 1) Release information about lagoon and the project and investigate interest in a citizens' foundation for the lagoon.
 - 2) Conduct a spring cleanup program (see Section e. below)
 - 3) Design the Lagoon Reserve Entrance and Informational kiosk (see Section g. below) with civic groups and high schools encouraged to propose designs.
 - 4) Design "San Dieguito Lagoon Ecological Reserve" signs, which are non-obtrusive and provide information about the resource area, as well as request no trespassing or littering.
 - 5) Solicit contributed materials for bench, viewing site, and sign construction.

- ° Environmental Impact: A higher level of public awareness about the lagoon will develop, especially through media attention. Signing will be non-obtrusive and encourage voluntary reduction of trespass and littering.

- ° Fiscal Impact: City costs will be in staff supervision time. Media coverage is anticipated to help communicate the program to the public. A good response can reduce governmental expenditures by providing design concepts, work assistance, and contributed materials (for use by the CCC in the construction phases.)

c. LEAST TERN HABITAT ENHANCEMENT

- ° Objective: Protect and enhance an area of critical importance to the endangered least tern.
- ° Lead Agency: Del Mar, with 22nd District support, and Conservancy grant.
- ° Location: Fairgrounds overflow parking area, 16 acres (Area VII).
- ° Prior Actions Needed: Agreement with 22nd District.
- ° Estimated Cost:
 - 1) Land: contributed or exchanged.
 - 2) Fencing (130 yards): \$1,755.
 - 3) Sand: free from Crest Canyon alluvial fan.
 - 4) Use of skip loader for loading; city trucks to carry sand (2 mile round trip); bulldozer to smooth sand = \$2000 for rental one month, with labor contributed by CCC, DFG, and the City.

- ° Tasks:
 - 1) Erect additional fencing (130 yards) to close gaps in existing fence and to reach the water's edge.
 - 2) Transport sand from Crest Canyon alluvial fan to spread evenly over the parking lot, providing an attractive substrate for least tern nesting. Periodically remove vegetation as necessary.
- ° Concerns:
 - 1) The present 15.9 acre parking area belonging to the 22nd District may be reduced by about 3 acres if Jimmy Durante Blvd is straightened in association with the construction of a new bridge. The fairgrounds would benefit from improved traffic circulation and, with the development of an alternative parking site to the east could be expected to assist in mitigation of the roadway's impact.

Through the environmental documentation to be prepared for the federally funded work, an arrangement would be made for establishing the remaining 12 acre area as a least tern preserve. The Fairgrounds Master Plan could expedite the execution of this mitigation.

- 2) Study of least terns has indicated their preference for nesting in wide-open areas without vegetation, on white sand littered with sea shells, and at a location adjacent to water for ready feeding. The sand from the Crest Canyon fan is light colored. However it is supporting a regrowth of vegetation which must be retarded.
- 3) Contribution of trucks, skip loader and bulldozer should be sought during the period of environmental assessment of the road alignment (prior to land reservation).

° Environmental Impact: The impact of possibly severing 3 acres from the 15.9 acre habitat area is mentioned above. However placing the great majority of land in preserve status with fencing and ground cover improvements will significantly improve the habitat. It should be noted that there is no guarantee the least tern will nest in this area. However, historical usage and the proposed improvements suggest a good probability.

° Fiscal Impact: Del Mar and DFG will have to provide staff supervision but the cost of fencing and trucks can be secured through grants and contributions.

d. MINOR CHANNEL AND WATER CIRCULATION IMPROVEMENTS

° Objective: Following existing configurations, improve water circulation through marshy areas without disturbance of the Salicornia.

° Lead Agency: Del Mar with CCC assistance

- ° Locations:
- 1) Adjacent to the east side of Camino del Mar bridge, leading to the northern pond and Salicornia marsh (Area II).
 - 2) Within the Salicornia marsh at the juncture of the main river channel and the south channel (Area IX-B)
 - 3) In the southeastern corner of the lagoon, where fresh water runoff in winter creates a temporary marsh (Area X-C)

° Prior Actions Needed: State Lands Commission finding of Public Trust; Del Mar/CCC Agreement; "NPDES" permit from RWQCB; DFG Section 1601, Streambed Alteration Agreement; Approval of CEQA negative declaration.

° Estimated Cost: Labor by CCC with City contributed equipment.

° Equipment: Trucks for soil removal; shovels; wheel barrows; mechanical ditcher.

- ° Tasks:
- 1) With manual labor, clear presently sediment-filled channels and create some new channels in three selected locations.

° Concerns:

- 2) Remove soil to presently sterile locations or salt flats which can be enhanced as nesting islands.
- 1) The three areas have the common characteristics of being well covered with Salicornia (pickleweed) with inter-twining small, sediment-filled channels which, if excavated, can improve tidal flushing and water quality.

2) Crews must avoid damaging Salicornia.

° Environmental Impact:

The primary benefits would be improved water circulation and less stagnation. Removal of material within the waterways can disrupt fish habitat and cause localized turbidity, but with only manual labor there will not be much capability to extend the work very far into the water. DFG will be asked to identify snags, etc. which should be retained. Flotsam and litter cleanup along the water edge would be beneficial to wildlife which can also be injured by these materials. Work would be done before Least Tern breeding starts.

° Fiscal Impact:

City staff time would be necessary to plan and supervise this effort. The 22nd District and the State Lands Commission, as well as DFG, would have to be aware and supportive of the effort, but no significant costs would accrue to these agencies. Trucks, gas, drivers, tools, etc., would be from the City and any commercial sponsors, while the majority of work hours would be provided by the CCC.

CLEANUP OF WASTE:

° Objective: Visual improvement and reduction of hazards.

° Lead Agency: Del Mar with CCC support.

° Location: Throughout the lagoon, on public lands, public trust waterways, and any private lands for which the owner provides permission to enter and assistance.

° Prior Actions Needed: CCC/Del Mar agreement; appointment of Del Mar Lagoon Coordinator.

° Estimated Cost: In-kind services.

° Equipment: Trucks, hand tools, possibly a winch.

- ° Tasks:
- 1) Cleanup of litter by volunteers, with possible part-time work by probationers.
 - 2) Cleanup of waterway snags and safety hazards by CCC.
 - 3) Waterway snags and poles which provide habitat value or bird roosting (e.g. blue heron roost) are to be retained. DFG advice is needed.
 - 4) City to begin abatement of safety hazards and nuisances around lagoon.

° Concerns:

- 1) State Lands Commission to be informed by letter of work along public trust waterways.
- 2) Cleanup to be orchestrated as part of the citizens involvement program by City Lagoon Project coordinator, with the major efforts in Spring 1980.
- 3) CCC cannot work on privately owned lands, but can be especially helpful in the water areas. Can work in public trust areas.
- 4) City to provide trucks for waste removal and site for disposal.

- 5) Work must be planned and supervised to avoid disruption of wildlife and vegetation prior to the April nesting season of the least tern.
- 6) Litter cleanup must be periodically repeated.
- ° Environmental Impact: The benefits would primarily be visual improvement and reduction of public safety risks. Removal of material within the waterways could temporarily disrupt fish habitat and cause localized turbidity, but with only manual labor there will not be much capability to extend the work very far into the water. DFG will be asked to identify snags, etc. which should be retained. Flotsam and litter cleanup along the water edge would be beneficial to wildlife which can be injured by these materials. Work would be done before least tern breeding starts.
- ° Fiscal Impact: City staff time would be necessary to plan and supervise this effort. The 22nd District and the State Lands Commission, as well as DFG, would have to be aware and supportive of the effort but no significant costs would accrue to these agencies. Trucks, gas, drivers, tools, etc., would be provided by the City and any commercial sponsors, while the majority of work hours would be provided by the CCC.

f. CONSTRUCTION OF SALT WATER TIDAL BASIN

- ° Objective: Creation of a tidal basin and mud flat in an unused lot owned by the AT&SF Railway Co. to increase tidal prism and enhance wildlife habitat.
- ° Lead Agencies: Del Mar and Conservancy
- ° Location: Railroad triangle (Area IV), 3.5 acres
- ° Prior Actions Needed: Dedication, lease or sale of surplus railroad land by AT&SF Railway Co. to the City; Section 10 permit from COE; approval of CEQA negative declaration.
- ° Estimated Cost: Pipe from basin to river channel to permit tidal flushing is estimated to cost \$17,000. The movement of soil (17,000 cubic yards) could cost up to \$34,000 if the work is contracted commercially; less if it is accomplished concurrent with Phase 2 or 3, sharing equipment; or if CCC & DFG crews can assist.

Equipment: If the pipe is installed by commercial firm, the remaining work can be accomplished by tractors alone, with the buffer berm incorporating all the spoils. If excess spoils result, trucks must be used for removal and a site selected (preferably at adjacent City-owned lot now used for soil storage).

- Tasks:
- 1) Excavate the triangle to an elevation of -0.5 feet to allow adequate tidal flushing.
 - 2) Install a pipe connecting the new tidal pond with the west channel of the river.
 - 3) Reconstruct the berm on the south side of the triangle as a buffer from the adjacent commercial development. Use spoils for berm material.

- ° Concerns:
 - 1) Project is dependent upon willingness of Santa Fe Railroad to lease, donate or sell the parcel.
 - 2) New water surface of 3 acres can improve the lagoon's overall tidal prism by about 10%.

° Environmental Impact: No adverse impacts are predicted. The improvement of the overall lagoon's tidal prism is significant and the increased water surface and mudflat is beneficial to wildlife. In addition, the improved tidal flushing will eliminate mosquito breeding problems which occur when standing water builds up in the depressed area.

° Fiscal Impact: As noted above, various arrangements can be made to reduce the overall cost for this effort. Ongoing maintenance is expected to be minimal but the pipe will have to be occasionally cleared. The adjacent Public Works Department of the City of Del Mar can assist in this effort.

g. CONSTRUCTION OF INFORMATIONAL KIOSK AND PERMANENT ENTRANCE TO LAGOON RESERVE

° Objective: Provide an entrance to the lagoon which will attract and inform the public, drawing attention to the ecological values of the reserve while preventing unauthorized access into the habitat area.

° Lead Agency: City of Del Mar

° Locations: 1) entrance gate at intersection of San Dieguito Drive/Grand Avenue; 2) informational kiosk on City property at San Dieguito Drive/Jimmy Durante Blvd. intersection.

° Prior Actions Needed: Publicity campaign; Del Mar/CCC work agreement.

° Estimated Cost: In-kind services and contributions.

° Equipment needed: Truck for delivery of materials; tools for construction.

- ° Tasks:
- 1) Entrance gate
 - a. CCC will build gate structure with materials provided by the community.
 - 2) Kiosk
 - a. City to conduct a design competition for construction of the Kiosk.
 - b. CCC will build the structure with materials provided by the community.

- ° Concerns:
 - 1) Entrance gate
 - a. The gate must be designed to withstand aggressive vandalism and forced entry. Sheriff's Department must increase surveillance of the site.
 - b. Grand Avenue will be the major thoroughfare for trucks carrying soil out of the lagoon during Phase Two. Therefore, the gate must be designed to permit movement by the largest trucks. Large mechanical equipment (such as dredgers) may have to be moved over the bridge -- therefore any crossbeams (for lagoon name identification, etc.) must be readily removable.

XIPNOB

2) Kiosk

- a. The structure must be visually attractive but designed to withstand vandalism.
- b. Design the kiosk to include educational material about the lagoon and its wildlife.

* Environmental Impact: Intrusion will be reduced. Public education benefits will be secured.

* Fiscal Impact: The in-kind services and citizen assistance will make this a project requiring no grants.

h. IMPROVEMENT OF CONTROLLED PEDESTRIAN ACCESS AND RECREATION

* Objective: Control public access to sensitive habitat areas while enhancing and facilitating access in areas where it would not conflict with protection of natural resources.

* Lead Agency: City of Del Mar

* Locations: 1) south banks of west and north river channels; 2) north east of Camino del Mar at the San Dieguito River; 3) enhanced least tern nesting area (Area VI).

* Prior Actions needed: Grants of easements for all locations still under private ownership; work agreement with CCC; completion of least tern nesting area enhancement for use as off-season recreation site.

* Estimated Cost: in-kind services and contributed materials result in negligible cost; labor would be contributed by CCC crews.

* Equipment: hand tools for trail construction; construction tools for building bench at lagoon overlook.

* Tasks: 1) retain the pedestrian accessway along the south bank of the river channel between Camino del Mar and Jimmy Durante Blvd. Post signs for pedestrian access.

2) Construct a bench for pedestrian use on the north side of the river channel, east of the highway, overlooking the lagoon (Area II). Build informational sign into the bench.

3) Police commercial activities along the south bank of the river east of Jimmy Durante Blvd. Insure that dumping of waste into the river is discontinued.

4) Improve trail along bank south of the river and east of Jimmy Durante Blvd. Post signs for pedestrian access.

5) Encourage use of least tern nesting site for off-season (September through March) sand lot - type sports such as volleyball, frisbee, golf. Provide City equipment for such uses.

* Concerns: 1) Off-season use of the least tern area may make difficult the prevention of access during the nesting season. Public cooperation would be essential.
2) Increased public use may increase need for local police and maintenance of the recreation areas.

* Environmental Impact: Facilitates public access in least sensitive areas. Will not impact on sensitive habitats; would increase public recreational opportunities in close proximity to existing facilities. Off-season use of the least tern area may provide a beneficial maintenance function by preventing growth of vegetation which would harbor predators, and by churning up the substrate, making a better surface for tern nesting.

* Fiscal Impact: Labor for improvements will be carried out by CCC crews; materials for benches and signing will be provided by the City and/or contributed by local fund raising projects. If volleyball nets or other equipment were provided, there would be some materials cost to the City. City maintenance crew time would be needed for clean up and trash removal.

3. PHASE TWO: Northern Tidal Basin Development

Objective: Enhance the wildlife habitat values of this area by construction of tidal basins and marsh areas.

Lead Agency: Department of Fish and Game

Location: The abandoned 9-acre sewage oxidation pond (Area IX-C) on the Del Mar 88 property (102 acres including Grand Avenue, the abandoned airfield, and foundation remnants of the former industrial structures (Area IX)).

Prior Actions Needed: Focused EIR; Section 404 and Section 10 permits from COE.

Estimated Costs: \$200,000 for tidal basin construction (89,000 cubic yards to be removed), plus land acquisition costs.

Equipment: Swamp cat, trucks, and probably a dragline, to create tidal pond and channel.

- Tasks:
- 1) Secure public ownership by WCB
 - 2) Reconstruct levees for tidal marsh using swamp cat and possibly a dragline.
 - 3) Excavate channel connecting tidal marsh to south river channel, parallel to Grand Avenue.
 - 4) Clean up and remove debris on airfield site (to be managed by DFG and carried out by CCC).
 - 5) Revegetate airfield with upland species, including trees to provide a possible rookery.

Concerns: 1) High cost of project must be reduced (use of State-owned equipment; possible private development trade-offs)
2) If dragline is used, protect pickleweed.
3) 89,000 cubic yards of earth in basin and 14,000 from connecting channel must be properly disposed of (preferably at Fairgrounds)

Environmental Impact: Construction of additional tidal pond area will have a beneficial impact by increasing the tidal prism and tidal flushing and the amount of water surface available for waterfowl.

Fiscal Impact: This phase requires extensive expenditure of public funds by WCB and/or other public agencies. Funding may be available from the Capital Outlay Fund for Public Higher Education (COFPH).

4. PHASE THREE: Fresh Water Marsh

Objective: Create a fresh water pond and marsh, with water replenishment from groundwater pumped by windmills.

Lead Agency: City of Del Mar, with Conservancy support

Location: Northeast portion of lagoon in abandoned 14-acre sewage oxidation pond (Area VIII).

Prior Actions Needed: Lease agreement with City of San Diego; arrangement for access to pond from Grand Avenue; approval of SWRCB for extracting water from the river.

Estimated Cost: Two windmills (including installation): \$17,200; Pumps for extraction of 70 acre-feet of water from the San Dieguito river supplied by Del Mar

- Equipment: Bulldozer and windmills. Possible future addition of aeration system to be powered by windmill.
- Tasks:
 - 1) Repair levees and clear vegetation from the bottom of the pond.
 - 2) Create (by bulldozer) two small islands before filling the pond, approximately 1/4 acre each in area.
 - 3) Excavate ditches in the bottom of the pond to impede growth of cattails.
 - 4) Extract 70 acre-feet of water from the San Dieguito River to fill the marsh.
 - 5) Erect two windmills to replace water loss, expected to be about 42 acre-feet per year plus an unknown amount of seepage.
- Concerns: A variety of periodic manipulative practices may be required to keep the marsh and pond productive and inoffensive to residents in the area. These include the following considerations:
 - 1) Emergent vegetation (e.g. cattails) may become very dense, despite management efforts. This problem may be remedied by periodically adding large quantities of salt water to the pond--cattails are generally intolerant of salt water.
 - 2) Emergent vegetation and mosquitoes may also be controlled by periodically drying the pond. Total drawdown can further eliminate bottom stagnation through aeration of sediments.
 - 3) As needed, removal of debris and bird carcasses from the pond is essential to minimize botulism outbreaks in waterfowl. Total pond drying can alleviate this problem.
 - 4) Public Health Department personnel may need to apply certain control methods on the pond if mosquito populations reach excessive numbers.
 - 5) Periodic cleaning of equipment will be required. Monitoring of evaporative losses and filling rates, with appropriate machine manipulations, will also be necessary.
- Environmental Impact: The close proximity of a fresh water marsh to salt water environments will greatly increase the overall productivity of the lagoon. The availability of fresh water can also attract a greater duck population and provide many species with a preferred source of drinking water. No rare or endangered plants or animals are currently found within the basin. Vegetation will have to be scraped out before filling with water, and some reptiles and small mammals (such as rabbits and mice) will be displaced. The lagoon contains substantial upland area (even after all rehabilitation work) that will accommodate this small population. The windmills also offer a nonconsumptive energy source, which will be highly visible to the public on Interstate 5 and to lagoon visitors.
- Fiscal Impact: If the fill-up water can be secured from the adjacent river during high volume winter flows by use of City-supplied pump, then a major cost of this project will be avoided. (Today's prices for potable water are \$125 per acre-foot.)

5. PHASE FOUR: Southern Tidal Basin Development

- Objective: Enhance the wildlife habitat value by excavation of tidal ponds and mudflats, creation of a new marsh, and channel construction to ensure adequate water circulation and increased tidal prism.
- Lead Agency: Department of Fish and Game
- Location: The southeast portion of the lagoon (Moshtaghi property-Area X) including the "fishhook" and the Crest Canyon alluvial fan (Area XII).
- Prior Actions Needed: Focused EIR; COE Section 404 permit; fan removal.
- Estimated Cost: From about \$270,000 for dredger work (not counting the costs for spoils disposal and mitigation of adverse impacts) to \$425,000 for dragline/swampcat/bulldozer work (184,700 cubic yards to be excavated.) The latter cost can be reduced with State personnel doing all but dragline work and purchase of dredge spoils by the 22nd District at low rates. EIR would be prepared by DFG staff.
- Tasks:
 - 1) Secure public ownership of all of the project area.
 - 2) Excavate "fishhook" channel and continue it north and back toward the west to join with the South Channel south of Grand Avenue.
 - 3) Dredge 16 acres east of new portion of channel to elevation of 0.0 feet, creating a new tidal pond, marsh and mudflats.
 - 4) Using manual labor, excavate narrow channels criss-crossing the new "island" (Area X-B), to increase marshy character of the area.
 - 5) Spread sand from the alluvial fan on a 1 to 2 acre portion of the new "island" creating potential least tern nesting habitat.
 - 6) Using hand labor or small equipment (e.g. trenching machine), improve the channel across the southern boundary of the lagoon to improve water circulation and ponding for fresh water marsh.
 - 7) When both tidal basins are completed on either side of Grand Avenue, a pipe connected to both will be laid underneath the street, to ensure tidal flushing and water circulation.
- Concerns:
 - 1) This phase is contingent upon the acquisition of the Moshtaghi property by WCB and is also distinct from the prior phases due to the need for heavier equipment (Phase Two may need a dragline but can apparently be done without a dredger). This phase requires at least a dragline and may also call for a dredger to achieve economy of scale. However the 12 and 16 inch dredgers continue to pose problems of massive soil disposal. As this phase is nears implementation (following land acquisition), the bids for engineering proposals will become the decision-making vehicle for determining which level of equipment is necessary. By this time it is possible the DFG will have increased its equipment pool for this kind of work.
 - 2) The consultants' proposed site for this basin and mudflat complex was in the southern part of Area X. However during the review process, DFG noted that substantial winter rain runoff passes through this area, coming from a culvert through the Interstate 5 roadway. The water pools at this lower elevation before percolation and spill into the fishhook channel DFG feels this area has important values for migrating waterfowl.

Therefore, the site for the basin has been shifted to the north closer to Grand Ave. While this change will require additional soil removal, about 50,000 cubic yards (the new site being 1½-2 feet higher in elevation than the old site), the change also puts the basin closer to the existing road and thereby reduces the length of temporary road needed for trucks to reach the soil dumping sites, making excavation somewhat simpler.

With the extension of the Fishhook Channel north and west and its connection to the South Channel, not only will water circulation and the tidal prism be improved, but the enclosed area of 15 to 20 acres should quickly revert to marshy status. If it is slow in doing so, some minor manual labor by the CCC can create the small diannels necessary to ensure a marshy condition.

Environmental Impact: This phase is essential for improving the lagoon's tidal prism by up to 50%. The land is presently high *Salicornia* marsh and the excavations would remove approximately one acre of this vegetation. However the land is now highly disturbed and the pickleweed is not extremely healthy. Especially near the airfield, where the new basin is expected to be constructed, the vegetation reflects the disturbed characteristics of the once developed site. The increase of tidal ponds, mudflats, and marsh channels also has value in retarding domestic animal and human access into the core area. In the middle of the channel loop is a salt flat which would be retained and enhanced as a potential Least Tern nesting island.

Fiscal Impact: The substantial cost for this phase should be borne by shared funding through WCB and the Conservancy. Funding may be available from COFPHE, as in Phase 2. In addition, the high environmental values of this phase suggest that federal help from the Land and Water Conservation Fund would be appropriate and should be sought by Del Mar and the Conservancy as part of developing a work program for Phase One.

6. PHASE FIVE: Upland Habitat Enhancement

Objectives: Increase overall habitat variety, resulting in an associated increase in wildlife species diversity and productivity.

Lead Agency: Department of Fish and Game

Location: All upland areas within the DFG-managed "Ecological Reserve", including the dry areas between the south channel/fishhook area and Interstate 5, as well as the sand dunes near the mouth of the river.

Prior Actions Needed: Public acquisition of all areas to be enhanced and completion of marsh enhancement in areas adjacent to the uplands to be enhanced.

Estimated Cost: Materials, equipment and labor to be donated and/or integrated into the management agency's program budget.

Equipment: Hand tools and construction tools.

Tasks:

- 1) Clear rubble and weeds from the upland areas.
- 2) Revegetate and contour the areas using native Coastal Sage Scrub species.
- 3) Construct a boardwalk and protective fencing from Camino del Mar around the sand dune habitat to the beach to reduce foot traffic on the dunes.

- **Environmental Impact:** Improvement of the habitat quality would enhance the value of the area for use by wildlife species. Construction of a boardwalk and fencing in the dune area would protect the fragile habitat from impacts of human disturbance.
- **Fiscal Impact:** Materials, initial labor costs and ongoing management would be absorbed by the management agency. Some or all of the materials for construction of the boardwalk could be donated by local citizens or groups.

7. PHASE SIX: Long Range Flood Channel Improvements

- **Objective:** Improve flood protection and lagoon stability by clearing the channel and reducing friction on the tidal flow.
- **Lead Agency:** City of Del Mar
- **Location:** Main river channel between Interstate 5 and the Pacific Ocean (Areas II and XIII) and into the South Channel to the Grand Avenue Bridge.
- **Prior Actions Needed:** Preparation of EIR/EIS; Section 10/404 secured.
- **Estimated Cost:** Up to \$250,000, depending on level of flood protection.
- **Concerns:** As in all lagoons and river mouths, channels of San Dieguito River have been constricted by heavy sedimentation. The lagoon has also been subjected to extensive fill and physical development which has constricted its flood capacity. In terms of lagoon stability, the sedimented channels create another constraint to adequate tidal flushing and water movement into the backwater areas, as noted in the discussion of the tidal prism; but because of the high expense of dredging and its primary flood management purpose, it has been identified for late phasing (four or more years) and funding from sources more appropriate than the Conservancy or WCB.
 - 1) Coordinate project design with the City's Jimmy Durante bridge replacement project currently under study. The estimated time frame for construction of the new bridge is 1981-1982, to be financed by federal urban bridge replacement funds.
 - 2) Seek "Small Watershed Project" funds (PL566) from the Soil Conservation Service or "Small Flood Control Project" funds from the Army Corps of Engineers.
- **Environmental Impact:** Dredging will cause short-term impacts by removing some benthic organisms and increasing turbidity. Benefits will include improved tidal flow and flood protection. A full EIR/EIS will be required at the time of project design.
- **Fiscal Impact:** Costs would most likely be borne by a federal grant, matched by 50% local funds if it becomes a Corps project.

APPENDIX C

REVIEW OF THE HYDROLOGY AND TIDAL INFLUENCES IN THE SAN DIEGUITO LAGOON

The dearth of information on many aspects of the functioning and existing state of this lagoon preclude a definitive approach to its enhancement and management. This enhancement plan must, therefore, ultimately be viewed as an experimental one, wherein optimal conditions are expected from the proposed design but cannot be guaranteed. Initial improvements were designed to permit continued lagoon development as funds and personnel become available. In order to augment current knowledge of west coast estuarine and lagoon systems, monitoring of physical and biological parameters is necessary.

This procedure will also clarify the structure and function of the San Dieguito Lagoon, thus permitting its more effective management.

This appendix summarizes the consultant's report on tidal influences and the lagoon mouth. Wendall Gayman of Sea Science Services prepared this material which staff has edited and augmented with an introduction. Citations and references have been excluded but can be found in the original report located at the Del Mar City Hall and the Conservancy offices. This appendix addresses the following topics:

Present conditions; assessment of lagoon stability; benefits of an open marine system; oceanographic influences (tides and waves), tidal flushing; tidal prism; achievement of natural flushing; and options.

PRESENT CONDITIONS

Since at least the nineteen thirties when the fairgrounds/racetrack was placed on fill, the lagoon mouth has been closed by sand bars except when high runoff of rain (or sewage when it was piped into the channels) has scoured the entrance.

In addition, the construction of the California Southern Railroad (1883-88) and the Santa Fe Railroad (1934), the Pacific Coast Highway (1912 and 1927) and Interstate 5 (1965-66), have dissected the lagoon channel systems and constricted their courses to the bridge underpasses. The construction of upstream dams at Lake Hodges and Lake Sutherland on the San Dieguito River have greatly reduced the volumen and scouring potential of the flood waters entering the lagoons.

The heavy rains of 1977-78 apparently created enough scouring of the interior lagoon to help keep the river mouth open into October, 1979. However, this status is probably also a result of the reduced sand load reaching the beach and the ongoing erosion of the shore as well. Sedimentation will reduce this prism and the gain can only be viewed as temporary. A closed lagoon mouth will again occur, resulting in an unstable eutrophic polluted water body.

ASSESSMENT OF LAGOON STABILITY

Geologists consider coastal lagoons and estuaries to be ephemeral features. Depressions in the coastline tend to be filled rapidly (geologically speaking) with sediments transported by fluvial processes and littoral currents. However, in human terms, the San Diego County Coastal lagoons have been almost as stable as other environments, except

when drastically altered by man: San Dieguito Lagoon, like other coastal lagoons was formed about five thousand years ago, and has probably changed very little during the one thousand years prior to 1900.

There is evidence indicating that the changes in patterns of erosion and sediment transport in the County have accelerated the lagoon filling processes during the last one hundred years. As a result of this filling, restrictions in tidal circulation, and the discharge of wastes into the lagoon, the biological character of the lagoon has been seriously degraded, and the natural populations have diminished both in numbers and diversity. Nevertheless, some of the lagoon habitats are still in excellent condition, and there are, in several areas, lush growths of marsh flora, and an abundance of fish and birdlife. In some respects, the channels may not have changed greatly from their 1889 configuration. Thus, wherever the lagoon channels have not actually been destroyed by filling, they have demonstrated a considerable degree of stability over the last fifty to one hundred years. A similar stability is evident in certain low areas which have not been developed.

The physical processes most likely to affect the stability of a lagoon result from fluvial and tidal flows, and the resulting erosion and sedimentation. The passage of floodwaters through the area has not altered it greatly during the last one hundred years. However, use of the basin and the emplacement of various structures has altered the watershed considerably, but there is only a limited amount of evidence which would lead to the conclusion that such changes have drastically affected the stability of the lagoon. Land use changes have increased the percentage and rates of runoff resulting in floods with greater volumes and higher peak flows. However, the Lake Hodges Dam and other structures have curtailed the runoff from most floods, thus reducing peak flows in the lower San Dieguito River Valley.

Present and future developments and land uses within the basin are also expected to increase the sediment yield. However, the Lake Hodges Reservoir will trap 100 percent of the sediment from the upper 88 percent of the basin. Thus the calculated sediment load carried by the lower San Dieguito River below the Dam is substantially less than the load that would be carried under natural (pre-dam) conditions.

The erosion of about 40,000 cubic yards of sand from Crest Canyon, and the deposition of this on a large fan built across the southern margin of the marsh during the last two years is certainly an unstable characteristic. If similar occurrences took place in the near future, then one could certainly conclude that the marsh area was unstable, and perhaps not worthy of substantial enhancement efforts.

Calculations suggest that in the past, the San Dieguito River has carried sufficient sediment to fill the lagoon within a few years. Either the sediment transport calculations are grossly in error, or much of the sediment load has passed rith through the lagoon during periods of rapid runoff. The presence of large volumes of sand on the beach and beneath the nearshore waters has been considered evidence for the latter assumption.

In terms of the water characteristics, the lagoon has exhibited substantial instability during recent years. The waters have ranged from very shallow, over much of the area, to several feet deep over most of the channel areas (when the lagoon remains closed, following several periods of moderate runoff). Probably the salinity has varied from less than two parts per thousand, during the winter to 32 to 34 parts per thousand when the lagoon is open during the spring; salinities of 40 to 60 parts per thousand may have occurred in some portions of the lagoon when it was closed and desiccated during the summers of the dryer years.

There are, of course, a number of organisms (particularly the water birds and marsh plants) that can readily adapt to such changes. But the impact on fish and invertebrates are more immediate and severe.

Whenever the lagoon entrance is open sufficiently to permit substantial tidal flooding, the lagoon's waters become remarkably stable with respect to temperature, salinity, and other characteristics.

Tidal flows do tend to carry littoral sediments into the lagoon. However, it is probable that the net sedimentation inside of the lagoon entrance that has occurred during the last fifty years is no greater than the amount of sediment deposited on the Crest fan during the last two years. Although there are some natural processes that are slowly tending to decrease the stability of the lagoon, the greatest threat is posed by the human development of the area. But we also have the ability to restore portions of the lagoon, and to increase its present stability, with a very modest effort. The simple expansion of the tidal prism should do a great deal to restore the stability of the lagoon.

With no tidal waters able to enter the two lagoons, a pattern exists of high water salinities in the summer and low salinity in the winter. This pattern is the result of waters within the lagoon evaporating (and concentrating the salts) during the summer, then being diluted by winter rainfall. These tremendous changes in salinity present a harsh environment for fish and wildlife. Most fish species can not survive such physiological stress. And, severe water surface changes caused by the drying up in summer of areas flooded by winter rains, prevent successful nesting by resident wildlife species dependent upon this source of ponded water.

Pollutants in the lagoon also go through the same pattern of concentration as does salinity.

Influences that can improve lagoon water quality (which includes, increase of dissolved oxygen, lower temperatures, moderate salinity) are stream flow, tidal flushing and wind action at the water surface. In the San Dieguito Lagoon, all three of these forces may operate at some time of the year, but generally lagoon entrance closure and stream-flow cessation have still minimized water quality and aquatic faunal diversity.

As a general rule, environmental characteristics (such as, salinity, water temperature and dissolved oxygen) become controlling or limiting only when they reach extremely low or high levels. However even slight dissolved oxygen changes can impact some species, in tidal marine systems. The above characteristics levels tend to be moderated, largely due to the circulation of water at regular intervals. In stagnant or enclosed waters, especially shallow waters, factor levels can become extreme, and can severely stress or kill aquatic organisms. Attached or benthic or planktonic invertebrates are generally more vulnerable to stress conditions than mobile organisms because they cannot escape to less stressful areas, although some species can endure harsh environmental factors for some time by retracting into the mud or their shells. In enclosed water bodies such as the lagoon, and particularly in those that are shallow and of relatively small area, even mobile organisms (e.g. fish) cannot escape. In these instances, the more tolerant species may survive but the less tolerant may die, resulting in a lower species diversity. If conditions continue to deteriorate, most organisms may ultimately die. In addition, the closed system does not permit passage of marine organisms into the lagoon, again limiting species diversity.

Lowered circulation in a closed lagoon would likely lead to problems with algal mat formation, eutrophication, and mosquito breeding. A closed entrance can also temporarily aggravate flood problems (but it will also resist high tides which can present hazards).

BENEFITS OF AN OPEN MARINE SYSTEM

Seasonal flooding of the San Dieguito River would naturally lower salinities in the lagoon waterways and temporarily reduce populations of aquatic organisms. Recolonization of the lagoon should follow quickly through an open entrance.

Faunal diversity and productivity in a marine lagoon should be the highest of all proposed water regimes, especially with daily tidal flushing. Faunal diversity in marine lagoons is low, especially for macrophytes. Floral (i.e. primary) productivity is known to be very high in coastal marine wetlands.

A marine lagoon may benefit the least tern by harboring larger numbers of small fish. An open lagoon may produce healthier or larger stands of *Salicornia*, the preferred habitat of the Belding's Savannah Sparrow. Thus, the latter species may benefit from a tidal marine system; its food source will probably be minimally altered by an open lagoon.

In summary, a marine system would benefit myriad marine invertebrates and fish, and possibly endangered species as well. Mosquito, eutrophication and flood problems would be minimized. All of these aspects would be beneficially affected even more if the lagoon entrance was kept open to continuous tidal flushing.

OCEANOGRAPHIC INFLUENCES (Tides and Waves)

The characteristics of most estuaries are dependent upon the topography (or bathymetry) of the estuary and the relative importance of freshwater flow, and the action of waves and tides. In Southern California, where the runoff is intermittent, and estuaries are very limited in size, the wave action also plays an important role in determining lagoon characteristics. The scouring action of entrance channel currents is constantly being countered by the influx of sediments deposited in the entrance channels by wave-induced currents. If an estuarine entrance channel is to remain open and stable, the ebbing tidal currents must have sufficient velocity and capacity to keep the channel free of sediments deposited by littoral currents.

Ocean tides along the Southern California coast are termed "mixed" because their characteristics fall midway between the semi-daily tides, which occur along the Atlantic Coast of the U. S. (and elsewhere) and the daily tides which occur along the Gulf Coast. Two high and two low tides occur off the coast of Del Mar almost every day. Usually there is a strong inequality between the elevations of both of the high tides that occur during a single day, and both of the low tides.

The mean tidal range along the open ocean shores of San Diego County is 3.6 feet. The average range between the mean higher high water (MHHW) and mean lower low water (MLLW) levels, which occur each day is 5.2 feet. The minimum daily range of the tides is about 1.5 - 2.5 feet, and the extreme (yearly) range of the tides is about 9.6 feet.

an lower low water (MLLW) is the normal datum level for tidal predictions and offshore hydrographic surveys. This is about 2.7 feet below mean sea level (MSL). Thus, along the open coast, the mean high water is 1.8 feet above MSL; mean higher high water is 2.6 feet above MSL; and extreme tidal elevations above mean MSL is about 4.9 feet above MSL.

The range of the tides varies considerably throughout the fortnightly tidal cycle. The neap period (which means low tidal influence) is characterized by minimum ranges (daily neap ranges commonly vary from 2.5 to 4.0 feet in the San Diego area). The highest and lowest tides in the cycle occur during the spring tidal period. In the San Diego area the spring tides commonly have maximum ranges of 6 to 8 feet.

The tidal ranges within San Dieguito Lagoon differ considerably from those ranges occurring in the adjacent open ocean. If the lagoon entrance is closed, then of course, there is no tidal action at all in the lagoon. If the entrance is open, water levels within the lagoon will tend to rise and fall, following water level elevation changes in the open ocean. However, the water levels in the lagoon will cease to follow the water level changes in the adjacent ocean whenever the open ocean water levels drop below the lagoon entrance channel sill level.

Tidal levels in the lagoon also differ from the levels in the ocean, because of the time delay necessary for waters in the lagoon to reach the levels in the open ocean. On a rising tide, the lagoon water levels lag behind and are thus lower than open ocean levels. On a falling tide, the lagoon water levels are higher than levels in the ocean. The delay is caused by the friction in the entrance and adjoining channels, and the limits (inertial effects) on flow velocities within the lagoon.

These factors affect both the timing and the range of the tides within the lagoon. The highest tide within the lagoon occurs sometime after the time of the highest water in the open ocean. Also, high tides in the eastern end of the lagoon may occur sometime after the waters near the lagoon entrance have reached their highest levels.

The elevation of the highest tides within the lagoon are lower than the elevation in the open ocean, and the elevation of the lagoon tides decreases with increasing distance from the lagoon entrance. The time delays and the extent of the damping of tidal ranges within San Dieguito Lagoon are not known.

The time delay for the occurrence of the high tides, and the extent of the damping of tidal ranges will depend considerably on the entrance channel characteristics (cross-sectional area and sill level) and on the dimensions of the various channels connecting the lagoon entrance with areas more distant from the sea. Lower sill levels, deeper channel depths, and larger cross-sectional areas should produce shorter delay periods, and reduced damping of tidal ranges.

Along the Southern California coastline the lower low tide always follows the higher high tide. Consequently, the maximum rate of tidal fall exceeds the maximum rate of tidal rise. It is for this reason that it is generally assumed that the maximum velocities of the ebb currents draining a tidal estuary would always exceed the maximum velocities occurring during period of flood tides.

The maximum rates of tidal level changes occur midway between the high and low tide slack periods. Water level change rates during the six hours between the high and low slack period commonly average 1.0 feet/hour and range up to 1.5 feet/hour.

Tidal flushing is important for two reasons. It maintains the high water quality of the lagoon which in turn is responsible for the quality of wildlife habitats and the abundance and diversity of organisms which inhabit the lagoon. Incoming tides bring in waters of nearly uniform salinity, medium temperature, and high dissolved oxygen content. These incoming waters also contain an abundance of plankton and other small organisms, and the waters are rich in nutrients. The outgoing tides remove waters from the lagoon which may be characterized by: undesirably high or low temperatures and salinities; depleted levels of dissolved oxygen, plankton, and certain nutrients; and relatively high concentrations of suspended silt, organic matter, municipal or agricultural wastes, and/or other chemical pollutants.

Tidal flushing is also important because the ebb currents may temporarily or continuously keep the lagoon entrance channel free of littoral deposits which would otherwise rapidly fill the entrance channel.

Rates of tidal flushing are dependent upon tidal ranges, entrance channel cross-sectional characteristics (especially "sill" depth), and the area and volume of the lagoon. These rates will be lowest during the "neap" tidal periods. High sill levels and small channel cross-sectional areas also result in reduced rates of flow. Conversely, high rates of flushing correspond with high spring tidal ranges, low sill elevations, and large channel cross-sectional areas.

Another factor of prime importance to the flushing rate is the volume of the lagoon between the level of the highest tide, and the lowest tide, or the highest tide and the sill level. This volume is termed the tidal prism, although the term may be used to define the volume of lagoon waters between any two tidal levels. In the technical literature, the tidal prism of larger lagoons is often defined as the volume between the MHHW and MLLW levels. The cross-sectional area of the entrance channel is usually assumed to be the area below mean sea level (MSL). These definitions are not useful in describing tidal conditions in small lagoons, because the sill level may be above (MLLW) and perhaps in some cases, even above MSL. The tidal prism between MSL and mean higher high water (MHHW) may be less than half of the prism between the sill level and the highest water level.

Large tidal prisms usually result in high rates of flow and high flow velocities in entrance channel areas. These high flow rates and velocities are often of critical importance in keeping the channel entrances swept clean of sediments deposited by waves and wave-induced currents. If the flow rates and velocities in any given estuary are not sufficient to keep the entrance channel free of deposits, then the entrance will be closed by natural processes.

THE TIDAL PRISM IN SAN DIEGUITO LAGOON

The tidal prism in San Dieguito Lagoon changes daily, with changes in the tidal range, and changes in elevation of the sill level. Changes in the sill level have not been studied, but one may assume that this level moves up and down, varying with the rates of flow through the

*The sill level is the highest elevation of sand, stones, and cobble occurring along the axis of the lagoon entrance channel.

entrance channel and rates of deposition by littoral currents. The rates of flow depend in part upon high tide levels which fluctuate cyclically during a fortnightly period. Ebb current flow characteristic may also be increased by freshwater flows.

Rates of littoral deposition will be dependent upon wave height, period, and direction of approach. High waves approaching the shoreline at large angles to the normal will usually produce high rates of long-shore transport.

The determination of any given tidal prism for San Dieguito Lagoon requires certain assumptions concerning the range of the tide, and information on the area of the Lagoon. Since the lagoon water surface area varies with the water elevation, precise figures are not easily determined. And averages are necessary.

During the three decade semidrought, the lagoon entrance was closed most of the time. The sill level was above the highest tidal levels. During this period, the effective tidal prism was zero. During the first six months of 19-9, the sill level appeared to be close to MSL most of the time, but periodic measurements were not made of sill elevations. With this assumption to identify the tidal prism, one needs merely to multiply the tidal range by the lagoon area. The banks of the lagoon are fairly steep, especially in areas between the railroad bridge and Jimmy Durante Bridge. Also, there are fairly steep 2-foot banks along much of the margins of the South Channel. Thus, below elevations of 3.5 to 4.0 feet, the lagoon area does not change drastically with changes in water level. Once the waters rise above 4.0 feet, large areas may be flooded (on the north side of the channel between the Camino del Mar and the railroad track, and east of Jimmy Durante Bridge, south of the main channel). However, the increase in area with higher water level is considerably less than occurs in some other undeveloped lagoons.

It has been determined from orthophoto maps that the lagoon has a low water area of about 30 acres, with a sill level of 1.0 feet, then MHW and MHHW tidal prisms are 2.3 and 3.4 million cubic feet, respectively. The calculated tidal prism would be large with the increase in area with increasing elevation. However, the actual tidal flow for any given ocean tidal range will be less than the tidal prism volume because tidal ranges in the lagoon are less than in the open seas. The extreme tidal prism corresponding to a 7.3 foot tide, will be larger than 6.0 cubic feet.

If these volumes are observed to be real, then ebb currents over a six hour period would average about 106 and 157 cfs for the MHW and MHHW prisms; peak flows may be two or three times this rate. If a channel cross-sectional area of 300 square feet is assumed then there would be an average flow velocity of about 0.35 and 0.52 feet/second, respectively. The average discharge during a six hour interval following the flooding of the lagoon by an extreme tide would be equivalent to a constant freshwater flow of about 287 cfs.

The volume of lagoon water below the sill is not known. However, the average depth may be about one to two feet. If the average depth is assumed to be about 1.5 feet, then the volume may be about 2.0 million cubic feet (45 acre-feet).

Using this value, the average inflow into the lagoon with each tide is about 1.3 times the volume of water below the sill. On the average, the water in the lagoon would be exchanged at least twice a day. Actually, the lagoon waters nearer the entrance are exchanged

more rapidly, and the waters most distant from the entrance, are exchanged less often. Also, during the neap periods average rates of exchange might be reduced to once every 37 hours.

Tidal prisms for San Dieguito Lagoon have in past literature been reported to be 0.2 and 0.8 million cubic feet. None of these references have indicated what tidal levels were used in calculating the prism values. Using the 30-acre area for San Dieguito Lagoon, an increase of water level of only 0.15 feet would account for the 0.2 million cubic foot tidal prism. The 0.8 million cubic foot tidal prism would require a tidal range of only 0.61 feet. Surely, these ranges are far too low, even for the MHW prism.

Information on the exact tidal range within the lagoon is presently not available. However, during the late spring of 1979 tidal levels in the eastern half of the lagoon were observed to range from 0.5 to 1.5 feet above MSL, and the highest tides (which occurred at night during this season) flooded areas as high as 4.0 feet above MSL. This suggests a maximum tidal range of 3.5 feet or more.

The limited historical evidence available suggests that the tidal prism of San Dieguito Lagoon has changed greatly during the last 100 years. The lagoon water area shown on the 1889 U. S. Coast and Geodetic Survey map of San Dieguito Lagoon covers about 42 acres. The area of the entire marsh has been determined to be about 570 acres. The 1889 map, and the 1928 aerial photographs show entrance area to the Lagoon to be much larger than it is now. Probably the sill level was lower in 1889, and the natural flushing at that time was much more like the flushing now taking place in the Tijuana Estuary. One might assume that one hundred years ago the value of the tidal prism in San Dieguito Lagoon for any given tidal range was two to four times larger than the present tidal prism.

THE ACHIEVEMENT OF "NATURAL FLUSHING"

The term "natural flushing" may be applied to a coastal lagoon when there is a continuous flow of tidal waters filling and draining the lagoon without the need for artificial maintenance to keep the lagoon entrance open. Channels maintained by natural flushing are subject to the same sedimentary processes which tend to silt in or plug the channels of artificially maintained lagoons. Sediments are carried into the entrance channel by littoral, tidal, and fluvial currents. The sediments deposited are subsequently eroded from the channel by high velocity ebb currents that sweep through the constricted tidal entrance. The width and depth of the channel are in equilibrium with the rates of deposition by various processes, and the rates of erosion resulting from tidal flow. Thus the entrance channels may remain stable for hundreds of years (without man's assistance) even though deposition within them may be more or less a continuous process.

Channel stability doesn't necessarily imply that the channels are stationary. Under completely natural conditions the channels are known to migrate back and forth along the shoreline, in response to natural variations in the controlling processes.

Sedimentation resulting from littoral drift is the primary process tending to terminate natural flushing. Natural flushing might be terminated by 1) a marked increase in littoral drift, or 2) a reduction in the tidal flow. It is recognized that the rates of littoral drift may increase markedly as the result of one or more unusually severe wave storms. However, there is no particular reason for believing that there has been or will be any substantial change in littoral drift rates.

*For comparison, the Tijuana estuary is reported to have a tidal prism of 2.5 million feet.

A reduction in tidal prism may result from both the artificial aural filling of the lagoon. The San Dieguito Lagoon tidal prism has been drastically reduced during the last one hundred years due to artificial filling. Also the stability of the natural channel has been reduced by constricting it (with the construction of dikes and bridges) in such a way that it is no longer free to migrate as a result of the natural processes.

It is believed that San Dieguito Lagoon probably was flushed naturally and continuously one hundred years ago, and perhaps as recently as sixty years ago. The loss of natural flushing is attributed to the reduction in the tidal prism. For this reason it is believed that natural flushing can be restored to the lagoon by enlarging the present tidal prism.

It has often been assumed that by relating the tidal prism of any lagoon to the entrance channel cross-sectional area one can determine the minimum tidal prism necessary for the maintenance of natural flushing in any tidal lagoon. Unfortunately, this assumption is not correct.

The processes controlling the natural flushing of small lagoons are complicated by several factors. First, the tidal prism is not a constant, but varies considerably throughout the fortnightly tidal cycle. Second, the entrance channel cross-sectional area varies rapidly with the stage in tide (and probably with the rates and velocities of tidal flow). There are no widely accepted methods for determining the tidal prism in a small lagoon. Prism volumes may be measured from some arbitrary level (often assumed to be the sill level) upward to the mean high water (MHW) level, the mean higher high water (MHHW) level, or to the highest level of tidal inundation. In most San Diego County Lagoons, the sill level is unstable, and probably varies considerably in elevation in response to erosive and depositional processes related to the semi-daily and fortnightly tidal cycles. Thus, the tidal prism may be difficult to measure with any high degree of accuracy. Of course, by making various assumptions, one can readily derive estimates for average, maximum, and minimum tidal prisms, but one might question the significance of these values.

The study of natural flushing is further complicated by the fact that the cross-sectional area, and entrance stability are strongly affected by short-term (daily, weekly, monthly, and seasonal) drift rates. These rates are not known, and are very difficult to measure; they have not been determined, directly or indirectly for periods of lagoon closure. Available rates of littoral drift are usually based on periods of one year or more. The use of long-term drift rates in the investigation of entrance channel dynamics would be somewhat analogous to attempt to study the occurrence of fluvial floods, if the annual rainfall was the only data available.

Rates of drift determined by entrapment yield data only on the net drift i.e., the difference between the littoral drift rate to the north, and the littoral drift rate to the south. Probably the lagoon entrance closure is more closely related to short-period littoral drift rates in one direction (either to the north or the south).

Therefore, it is concluded that while the processes controlling the stability for small lagoon inlets may be fairly well understood in a qualitative sense, there is insufficient data available to enable one to determine the minimum tidal prism necessary for the maintenance of natural flushing through the inlet.

It appears that the magnitude of the necessary tidal prism enlargement might best be determined by: 1) studies of the area or volume of the lagoon when it was last known to be tidal, and 2) comparisons with other small lagoons that are naturally flushing; adjustments might be

made for certain physical differences in the areas compared. It is believed that such methods will provide useful data but, because of the deficiencies in information on short-term littoral drift rates, the resulting minimum prism enlargement values should still be considered experimental.

One course of action which one might follow in implementing tidal prism expansion would be to plan several stages of enlargement. For example, one might increase the tidal prism by 100,000 cubic yards, and then test the results for a suitable period. If frequent closure occurred, then the tidal prism might be enlarged by another 100,000 cubic yards. If natural flushing does not work at some point where further prism expansion is not feasible, then it would be necessary to resort to other methods. However, the increase in the tidal prism would make the operation of most other methods (i.e., those not dependent upon flow through pipes) easier, less expensive and/or more efficient.

The cost of providing natural flushing results primarily from the expenses incurred in increasing the tidal prism. This depends upon two factors, land and excavation costs. The problem of land acquisition is outside of the scope of this report.

Excavation costs depend upon the methods and volume of excavation, sediment and water table characteristics, the location of disposal sites, and the elevation of the land excavated.

The most cost efficient excavation would be solely limited to the removal of sediments found within the range of the tidal prism elevations. The removal of sediment from below the sill level and from above the highest tide level does nothing to increase the tidal prism. However, any materials above the highest tidal levels in any excavation site must necessarily be removed in order to excavate the lower layers. Also, it may be useful to excavate below the sill level 1) in anticipation of lowering the sill level in the future, 2) to allow for modest rates of sedimentation, 3) to provide basins for fish and other swimming organisms, and 4) to reduce the friction resulting from current flows. For these reasons it appears that in some areas perhaps 2 to 3 cubic yards of material will have to be excavated for every cubic yard of increased tidal prism.

One objective of the plan is to restore the circulatory characteristics of the lagoon, as nearly as possible and within the limits of feasibility to conditions which are believed to have existed in the lagoon one hundred years ago. During the 19th century the lagoon was thought to have been open to the sea continuously and flushed daily by the tides. It is not practical to reconstruct the marsh exactly as it existed in the late 1800s. However, attempts can be made to reconstruct, enlarge, or restore the tidal prism to its earlier, natural volume. Although this might be done by excavating a number of narrow, winding channels, it is more economical to dredge one or several small basins. This would produce the same affect on circulation, although it falls somewhat short of recreating the exact habitat types that previously existed in the area.

The three decade semidrought also may have contributed substantially to the alteration of the lagoon during recent years. The supply of runoff into the lagoon assists in keeping the entrance open to tidal flushing. In the event that the entrance is closed by littoral deposits, it should reopen naturally whenever the fresh waters within the lagoon have accumulated to such an extent that overflow over the sill occurs.

Freshwater flows during the recent dry period have been inadequate to sufficiently cause overflow of the lagoon, and the reopening of the entrance. The shortage of runoff has also been greatly aggravated by the presence of the Lake Hodges dam, which trapped all of the flow from the upper 87 percent of the basin for more than 30 years.

Because the factors described above, it has been concluded that the conditions observed in San Dieguito Lagoon since 1945 have been neither average or natural. The limited historic evidence available, and the example presented by the Tijuana Estuary, suggest that under natural conditions the small San Diego County lagoons are open to the sea all or most of the time. If this supposition is correct, then it would follow that the maximum populations and diversities within the lagoons would occur when the entrances are continuously open to tidal flow.

The proposed plan, based upon natural flushing, has been advocated because it is believed that

- 1) it will restore natural flushing as it was believed to exist in the lagoon one hundred years ago
- 2) it will, if successful, terminate the need for periodic maintenance of the entrance
- 3) it will diminish the initial inundation hazard resulting from winter flooding, and
- 4) it will provide higher water quality than might be achieved by any other plan not requiring the entrance to be continuously open

It is expected that the higher water quality will provide higher quality habitats which will accommodate more abundant and diverse biological populations.

OPTIONS

There are a number of other ways in which the San Dieguito Lagoon entrance might be kept continuously open. Some of these include:

- 1) jetty construction and periodic dredging
- 2) use of underground pipes (underground, underbeach, and under-water pipes)
- 3) use of bulldozers and other earthmoving equipment for sill excavations
- 4) pumping water into the lagoon from offshore
- 5) use of tidal gates
- 6) fluidization of the channel bed

The first four of these are almost certainly technically feasible. However they may be characterized by very high initial costs, high operational costs, and/or severe environmental impacts. The last two techniques may be less expensive, but have not been proven to be technically feasible for San Dieguito Lagoon-type situations in the Southern California area.

While two underground pipes are proposed within the lagoon for sub area connections this technique is not otherwise relied on. Only Option #3 is suggested in the plan as an alternate or emergency technique.

The economic feasibility studies for the more expensive projects can only be based largely on costs for similar projects that have been constructed elsewhere. For this reason, and because of the variabilities in sediment transport, unknown foundation conditions (for underground pipes), and the sparsity of information on nearshore construction costs, the economic date is not precise.

SAN DIEGUITO LAGOON CHANNELS EXCAVATION ESTIMATES

CHANNEL	PRESENT CONFIGURATION	PROPOSED CONFIGURATION	SPOILS ** (CUBIC YARDS)
WEST CHANNEL (Ocean to channels juncture)	Width: 200 to 280 feet Depth: 0 to +4.0 feet	Width: Same Depth: -4.0 feet	River Mouth = 2000 cy; From Hwy 101 to Railroad Bridge = 38,500 cy; From Railroad Bridge to JD Bridge = 44,000 cy; From JD Bridge to River Juncture = 8000 cy. TOTAL = 92,500 cy.
NORTH CHANNEL (Main river channel, juncture to I-5)	Width: 100 to 200 feet Depth: 0 to +7.0 feet	Width: Same Depth: Unclear -- Quantity on flood carrying capacity projections.	
SOUTH CHANNEL (Juncture to band of "Fishhook")	Width: 0 to 1200 feet Depth: +15 (at fan deposit) to -1.5 feet	Width: 70 to 1200 feet Depth: -1 to -4.0 (dredging in 70 to 100 foot wide strip only)	From River Juncture to Grand Avenue Bridge = 7,700 cy; From Grand Avenue Bridge to curve of "Fishhook" = 18,000 cy. TOTAL = 25,700 cy.
"FISHHOOK" EXTENSION	Width: 30 feet Depth: +1.5 to +3.0 feet	Width: 100 feet Depth: -1.0 foot	At curve of "Fishhook" = 26,000 cy; (assumes prior removal of fan); New channel extension = 47,000 cy; TOTAL = 73,000 cy.

* Depth has been estimated at the sill level which is assumed to be +1.0 foot above mean sea level.
** Total to be excavated for channels = 191,200 cy. plus North channel (see also TIDAL BASINS-304,700 cy. to be excavated from these areas).

SAN DIEGUITO LAGOON TIDAL BASINS EXCAVATION ESTIMATES

BASIN	SIZE (Pond & Mudflat)	NESTING ISLAND	MUDFLAT	SPOILS (CUBIC YARDS)
WEST TIDAL BASIN (Railroad Triangle Area IV)	3.5 Acres	None	Total Area	17,000 cy
NORTH TIDAL BASIN ("Del Mar 83"; Area IX-C)	9.5 Acres	0.7 Acres	1.5 Acres (included in total)	89,000 cy
CONNECTING CHANNEL BETWEEN NORTH TIDAL BASIN AND SOUTH CHANNEL	4.4 Acres	None	None	14,000 cy
SOUTH TIDAL BASIN * (Mostaghi Property; Area X-C)	15.8 Acres	3.0 Acres	5.7 Acres (included in total)	184,700 cy
TOTAL	33.2 Acres**	3.7 Acres	7.2 Acres	304,700 (see Channels for 204,700 plus cy to be excavated)

* In a change of the consultant's recommendation, this Basin was shifted north towards Grand Avenue to avoid a Freshwater Intermittent Marsh Area. However, this area is higher ground and adds about 50,000 cy. of soil to be excavated.

**Channel modifications will add another 5.4 acres of new water surface to this amount (plus tidal flats).

Total Excavation = 496,000 cubic yards (plus soil from flood control dredging)

APPENDIX D

GENERAL GUIDELINES FOR COASTAL LAGOON MANAGEMENT

A. GENERAL

1. Marshes are geologically transitory (i.e. forming and disappearing over a period measured in thousands of years) due to sedimentation and ultimate infilling from deposition of eroded soils. Watershed development vastly accelerates the process but human intervention can also restore wetlands to a higher level of biological productivity.

a. Almost all wetlands suffer some degree of sedimentation requiring rehabilitation or maintenance to improve water circulation.

b. Wetlands are highly effective sediment traps, more effective even than other forms of quiet water bodies.

c. Wetlands have a low-energy water motion regime in which the natural processes at work will cause the water basin to fill with sediment until an energy state is reached which supports sediment transport through the area. The system is dynamic--there is no permanent (i.e. lasting longer than 10,000 years) way to preserve low-energy environments. (U. S. Army Corps of Engineers, 1976).

2. Coastal lagoon areas with restricted freshwater supplies are suited for marine and intertidal habitat maintenance, due to the natural history and the "coastal dependency" of these habitat types.

⁰However the proximity of freshwater habitat near salt marshes is highly desirable (see E-1).

3. Each marsh has its own specific ecology, problems, and personality, but there are common features and management techniques for marshes. However, management techniques and principles have been poorly documented in formats usable by local planners, citizens, and political decision-makers.

a. "The marshes of San Francisco Bay have both unique characteristics of their own and general characteristics they share with marshes throughout the world." (Harvey, et. al., 1977)

b. "Brackish to freshwater marshes of North America are floristically quite similar ..." (U. S. Army Corps of Engineers, 1976)

c. "There is definite need for...a publication (on wetlands restoration in California) but no one has ever found the time to put it together. Even though much of the material that is needed for these guidelines has never been published, it is available in one form or another." (Hunt, DFG, pers. comm., 1978).

B. MARSH MANAGEMENT

1. The goal of all wetland management efforts is the maintenance of the carrying capacity of coastal ecosystems at the optimum level. (Clark, 1977)

a. "Carrying capacity" is the capability of the ecosystem to sustain an optimally balanced resource base (Clark, 1977).

b. The high productivity and capacity of wetlands to store nutrients and plant material provide stability, buffering these ecosystems against fluctuations in nutrient input (Clark, 1977).

⁰The plant productivity and carrying capacity of coastal waters are normally limited by the amount of available nitrogen (Clark, 1977).

c. The potential of any coastal water basin to function effectively as an ecosystem--to provide ecologic benefits to mankind--is governed by the interplay of chemical, geological, physical, and biological factors. The capability of an ecosystem to provide benefits is termed "ecological carrying capacity," that is, the amount of recognized resource value that an ecosystem can supply to fulfill human needs (e.g., shellfish, wildlife, clean water, and scenic values) (Conservation Foundation, 1977).

2. "Marsh management" is basically the manipulation of water supply to ensure good circulation and flushing, to encourage the growth of desirable native plant species, to control undesirable plant species, and to minimize populations of mosquitoes and other nuisance organisms.

a. See also D-9 regarding water drawdowns and E-5 regarding deep ponds for duck usage, etc.

b. The elevation of water relative to land, the range of tidal fluctuations, and the force of tidal change are the keys to restoration (U. S. Army Corps of Engineers, 1976).

c. Periodic monitoring of marsh water level, rainfall, streamflow, vegetation, sediment volume, and inflow are required or useful for efficient water management (County of San Diego, 1976).

3. Defining the outer edges of a marsh can be difficult but is essential to a management program--the area of application of laws and zoning must be known and the establishment of a buffer (see Section F) is based on the marsh boundary.

a. The use of indicator plant species is the most effective way to define the approximate marsh edges. The point where the abundance or density of upland indicator plants is greater than that of wetland indicator species is the approximate edge of the marsh. Soils are also an indicator.

b. In California salt marshes, Salicornia usually extends to the upland reaches of the marsh.

c. The lower littoral zone of "a marsh...extends from the edge of of the sea to elevated areas and consists of zones of vegetation which are made up of: plants that are rooted in and adapted to water surface at mean high water; soils and plants that are subject to tidal activity at some time during the day." (Army Corps of Engineers, 1976)

d. "There is a gradation in plant species from the lowest elevation of the wetlands up the slope to the upper boundary of the wetlands. It is relatively easy to find the point above which there is no significant growth of salt-water-tolerant plants, where the floodlands begin. This will be the upper boundary of the saltwater wetlands, and will approximate the annual high water mark--the point of the highest expected yearly storm surge." (Conservation Foundation, 1977)

C. LAGOON STABILITY

1. Development of a stable lagoon, with adequate tidal prism and flushing, will create an ecologically beneficial open marine environment.

a. An open lagoon mouth permits access to the interior by marine species.

b. Maintenance of an open marine environment reduces biological stress and enables marine organisms to survive, thereby supporting a diversity of life forms.

c. A stable salt water regime supports the growth of Salicornia species, which have wildlife value and resist high marsh erosion.

d. Stability is a result of regular, vigorous tidal flushing, which removes sand and sediment build-up, maintains the open marine environment, and facilitates flood passage.

e. A stable, well-flushed marine environment is less likely to suffer mosquito problems than an environment with poor water circulation.

2. Because of state-of-the-art deficiencies in determining minimum tidal prism needs, the success of attaining a self-maintaining open-lagoon condition through human alterations cannot be guaranteed.

a. However if initial modifications are not completely successful in producing a continuously tidal lagoon, it is quite likely that they will facilitate the maintenance of the lagoon entrance with reduced effort.

b. The success of creating a self-maintaining entrance may depend somewhat on climatic factors (rainfall, runoff, sea storms) which are highly variable.

c. There are no widely accepted methods for determining tidal prism in a small lagoon.

3. Without an open lagoon mouth or high runoff rates, the lagoon may become hypersaline and eutrophic. Most marine organisms would die under these conditions.

4. Unstable conditions (in water volume, water level, salinity, and temperature) produced by alternation between salt and fresh water states will not make much difference to a wide variety of bird species which use the wetlands, but will have a strong adverse effect upon freshwater and marine fishes and marine invertebrates.

D. MANAGEMENT

1. The single most important element of marsh management is water supply--either fresh water supplies or assurance of full tidal flushing. (County of San Diego, 1976)

2. The patterns of water circulation govern the productivity and carrying capacity of a wetland (Clark, 1977)

a. Other things being equal, a flowing system is much more productive than a standing water system.

b. Inundation of marshes by tide and/or storm runoff is important because nutrients carried by the water and the detritus produced by the marsh can be exchanged. (U. S. Army Corps of Engineers, 1976).

c. The ebb and flood of the tide continuously provides food, nutrients, and oxygen to the biomass; and waste products are simultaneously removed or assimilated into the estuarine ecosystem.

d. Shallow marsh areas are highly productive but they may have mosquito problems (see D-11) unless the water is flowing.

e. Marshes must receive a water flushing action to remove pollutant buildup and stagnancy. (Cal Poly, 1977) (Arcata, 1979)

f. Construction of channels can increase flow and flushing.

3. The tidal prism of a salt marsh must be adequate to secure a cleansing action.

a. "Tidal prism" is the volume of water which is exchanged in a given area by one tidal movement.

b. The size of the tidal prism is more strongly dependent on the surface area of the tidal inlet, rather than the depth of the water in the enclosure, since the tidal action is strongest across the water body rather than through it (Cal Poly, 1977).

4. The control of the water level in the marsh will allow colonization of favored plant species, elimination of some undesirable weed species or excessive growth of others, and easy access to mosquito breeding areas for control (County of San Diego, 1976).

5. Maintenance of natural salinity patterns is conducive to maximizing carrying capacity and productivity. (Clark, 1977)

a. The functioning of the coastal water system is influenced by the intermixture of fresh and salt water and the resulting salinity, which controls the types of species and their abundance. (Clark, 1977)

b. Freshwater flow in an estuary or coastal lagoon dilutes salt water and fosters an especially rich and varied biota, deters oceanic predators, and can create a two-layer beneficial flow (Clark, 1977) called a "salt wedge" or "tidal wedge."

c. The mixing of waters of different salinities produces a sort of nutrient trap. Valuable nutrients are not swept out to the ocean but flow with the tide among living organisms, the water, and bottom sediments. The ebb and flood of the tide continuously provides food, nutrients, and oxygen to the biomass; and waste products are simultaneously removed or assimilated.

d. The natural volume, rate, and seasonal pattern of freshwater inflow provide for optimum ecosystem function. Surges of fresh water inflow can upset the seasonal pattern and normal salinity range. (Clark, 1977)

6. Wetlands purify and regularize the flow of land runoff into coastal waters (Clark, 1977; Arcata, 1979)

a. "Based on studies conducted by Cardon, et. al. (1976), it appears that significant amounts of nitrogen can be removed from wastewaters in marsh areas." (Jones and Stokes, 1977)

b. "As a rule, discharge or release of pollutants into the wetlands should be prevented. However, there may be some capacity for the wetlands to absorb certain storm runoff pollutants and thereby to function as a 'land treatment' system. Any such pollutants should not exceed the calculated receiving capacity of the system and should not degrade surface water or groundwater below allowable standards." (Conservation Foundation, 1977)

7. Ample supplies of dissolved oxygen are required for efficient ecosystem function and maximum carrying capacity (federal guidelines recommend a minimum of 6 ppm of oxygen but prescribe 4 ppm). (Clark, 1977)

8. A naturally balanced temperature regime provides for optimum ecosystem function. (Clark, 1977)

9. Water drawdowns can be a beneficial management tool. Seasonal (or intermittent) marshes are often more productive than permanent marshes.

a. In marshes managed for waterfowl production, drying removes nuisance vegetation and permits new shoots to grow when the water is returned (new growth provides food to wildlife); promotes growth of the desirable annual plants; and controls undesirable emergents. (Jones and Stokes, 1978)

b. In controlled salt water marshes, a water drawdown or natural evaporation is desirable to expose mudflats for shorebird nesting. (County of San Diego, 1976)

10. Vegetation management is a function of water management. Mosquito control is a function of water and vegetation management.

11. Mosquito management requires:

a. A water depth of at least four feet in any permanent ponds (County of San Diego, 1976), to hinder mosquito breeding and support populations of mosquitofish.

b. The elimination or reduction of fluctuation of pond water levels, to hold vegetation to the edge, facilitate use of mosquitofish, and minimize water impoundments that could function as breeding sites. (County of San Diego, 1976)

c. Drainage to remove standing water.

d. In some cases, flattening the bottom of the pond to remove hummocks (mounds) which can reduce the water depth to one in which mosquitoes can breed.

e. Vigorous flushing by tide and/or runoff.

12. Densely vegetated wetland areas are enhanced by increasing water surface by such means as blasting or bulldozing potholes or creating basins or channels. Nesting islands in the center of these areas are desirable.

13. Rehabilitation work to improve water circulation will require site alteration through dredging, bulldozing, dragline operation, etc., all of which create short-term adverse impacts and require permit approvals which are difficult to obtain.

a. The disposal of dredge spoils can be the most difficult phase of the operation.

°Land placement of spoils is favored over ocean disposal, for which costs are high and permit approval difficult to obtain.

°That rehabilitation work which creates the least amount of spoils is often the preferred option from a time and cost viewpoint.

°The use of suction dredgers can create more spoils than necessary for most wetlands work.

°Excavated soil can often be used for construction of nesting islands, levees in the flood fringe area, and elevated use areas where appropriate.

b. The "swamp cat" (low-ground pressure tracked vehicle) variety of a caterpillar tractor offers the greatest flexibility in lagoon mouth work and wet or even submerged land movement. Public ownership of such vehicles is desirable for public projects to enhance wetlands.

c. A topographic map, preferably at one-foot contours, is necessary for the area within which land movement is to be planned. Knowledge of elevations is necessary to determine how the work will affect the movement of flood waters and also will indicate the most promising areas for excavation of channels or ponds.

d. Tidal basins are important in lagoons with a high degree of sedimentation or land filling, to increase water surface, tidal flushing, tidal prism, and water bird resting/feeding areas.

°The amount of water surface is the key factor in increasing tidal prism, with depth of water secondary in importance (see D-3).

°Any improvement in tidal surfaces will increase the chances for maintaining an open lagoon mouth and reduce the work/ investments necessary to keep the lagoon open.

E. WILDLIFE HABITAT AND VEGETATION ENHANCEMENT

1. Ecotones (transition areas between different ecological communities) support a high abundance and diversity of life. (This property of ecotones is sometimes called the "edge effect".)

a. "...regarding the significance of fresh and brackish marshes--where they interface with salt marshes...the ecological significance of such wetlands is very important. It is axiomatic that diverse habitats produce diverse wildlife resources and there is a quantitative factor also." (Browning, DFG, pers. comm., 1978)

b. "...it is a familiar principle for ecologists that intermixed areas with overlaps of ecological types are more productive and support a greater diversity of species than any 'pure' habitat." (Heath, 1966)

c. "An ecotone combines the characteristics of the two communities it separates and often has an unusually high abundance and diversity of life...(and) thus serves a uniquely beneficial function..." (Clark, 1977)

2. The concept of habitat diversity includes, but goes beyond the "ecotone" concept, to include multiple physical variations within a habitat area:

a. Birds. The greater the interfacing of different habitat types and structures, the greater the expected avian species diversity. Birds respond to habitat structure variability afforded by vertical structures (trees, bushes, poles), islands, small embayments in sides of channels or ponds, different size ponds and depths, variable soil types, and multiple land configurations.

b. Aquatic invertebrates. Marine organisms favor different bottom sediment compositions and a variety of "structural elements" (large rocks, cobbles, pilings, water current changes, vegetation, etc.).

c. Fish. Fish benefit from different water currents, varying depths, and a variety of bottom cover (sand, rock, cobble, kelp, eelgrass, etc.).

d. Species diversity fails to increase with habitat diversity when excessive habitat variability creates only small patches of usable areas.

3. Most wetland species cannot tolerate disturbances from adjacent urbanization and must be buffered from impacts (see Section F). But there are variations in degrees of sensitivity among various species.

a. Unrestricted access by people and domestic animals is extremely harmful to wetland wildlife. Access should be restrained by fencing (which for esthetic purposes should be of "naturalistic" materials, color, and texture) or other barriers.

b. The development of nesting islands from dredging spoils and the construction of channels around the periphery of the management area can retard human and pet access.

4. Wildlife habitat in marshes is dependent, above all else, on a constant water supply. (See D-1)

5. Open water is an important habitat. Open deep ponds are necessary to support duck usage as well as to retard undesirable vegetation intrusion (and to control mosquitoes).

6. Habitat used by rare or endangered species requires the highest level of protection and, if there is to be mitigation for unavoidable impacts, the new habitat must be in place in equal or greater quantity before the original area is damaged.

7. Salicornia vegetation is important to birds because it provides some resting and nesting cover and supports insect populations. It also retards soil erosion and contributes to detritus production.

8. Cattails occur in freshwater to brackish marshes and, while providing some food and habitat value, can become overabundant and harmful to marsh species diversity.

a. Cattail overabundance and its matting effect can reduce waterfowl and shorebird habitat, as well as reduce human access for mosquito abatement work. (County of San Diego, 1976)

b. Cattail growth can be reduced by maintaining a constant deep water level, which is more desirable than burning, draglining, or bulldozing.

9. Planting of desirable marsh plant species (revegetation) is sometimes desirable, but may not always be successful (e.g., San Francisco Bay cases), and revegetation may better be left to natural succession.

a. "In preparing a site, the area available for planting can be increased by making the slope as gentle as practicable without the ponding of water. The gentler the slope, the larger will be the alternately flooded and drained areas." (Clark, 1977)

b. Native plants are the more desirable unless it can be shown that an exotic species will produce desired results and will not take over from nor fill the niche occupied by a native species (Harvey, et. al., 1977).

F. BUFFERS

1. Marsh and mudflat wildlife require protection from close visual contact with humans. (Madrone Associates, 1978)

2. A landscaped buffer between a marsh and human uses will add security and, with proper plantings, can add habitat value.

a. Deed restrictions should be recorded to assure continued maintenance of buffer areas. (City of San Rafael, 1978)

b. Buffer zone landscaping can enhance the ecotone effect (see E-1).

c. Wooded areas near wetlands contribute to a balanced wildlife community, for example providing potential nesting areas for egrets and herons.

3. Cropland near wetlands in some areas can furnish foods for upland game birds and other wildlife (but see G-6 regarding farm pollution).

4. Control of noxious weeds may be necessary for agricultural use, but some local government weed ordinances also require removal of vegetation which is useful to wildlife.

5. Buffer areas adequate to protect wetlands will vary in width according to the adjacent land and soil conditions and the development uses, local zoning, and density of human and pet populations in the vicinity.

6. Buffers are more defensible legally when they include flood and other hazard areas, and are at least partially conditioned on protecting the public health, safety, and welfare (see G-2-e).

G. WATERSHED MANAGEMENT

1. Control of erosion and the resulting sedimentation in streams, wetlands, and water basins is a primary goal of watershed management.

°Reduction of the speed of runoff water is a primary method to protect soil from erosion.

2. Increased sedimentation from careless construction practices seriously damages streams. Construction can increase soil erosion by removing vegetation which stabilizes soil with its roots, leaves, and litter; and by removing topsoil, grading slopes, and leaving large expanses of bare land exposed to wind and running water. The amount of sediment eroded from areas undergoing urban development can be far greater than from any other major land use. Urbanization can produce 20 to 200 times as much sediment as farmland does.

a. In site preparation, barren soils should be rapidly stabilized through revegetation and sediment should be detained on-site.

b. Grades should be designed to direct flows along natural drainage courses and through natural terrain where the vegetation can cleanse and filter runoff waters.

c. Paved surfaces should cover a minimal area to allow rapid and sufficient water infiltration into the soil.

d. Significant amounts of land may be required for buffer strips, runoff detention areas, groundwater recharge areas, and other water protection measures. However, creative use of such areas for recreation, decorative purposes, or privacy screens will permit uses of high benefit to the owners. (Conservation Foundation, 1977)

3. The use of sedimentation basins directly upstream from lagoons is probably not economically feasible in larger drainage basins.

4. "The higher the degree of development, the greater the need to provide vegetative buffers along drainageways." (Clark, 1977) Riparian vegetation not only provides a highly vital and diverse wildlife habitat but acts to retard one of the greatest sources of erosion -- that from streambanks--and also filters overland flow.

5. Nonstructural flood control measures are generally more desirable than structural measures in the watershed. (Clark, 1977)

6. Farm operations and cropland erosion in the watershed must be well managed to protect coastal ecosystems from damage by fertilizers, biocides, sedimentation, and altered runoff. (Clark, 1977)

a. Croplands and rangelands should be set back from watercourses to provide a vegetated buffer area. (Clark, 1977)

b. Upland farm layout should minimize alteration of natural drainage and prevent water pollution. (Clark, 1977)

7. Paved surfaces collect and channelize a broad variety of pollutants which are a major source of water quality problems. (EPA, any 208 document)

°Some advocate that runoff water be channeled away from wetlands. But the marsh purification processes can in fact be used to clean up such "nonpoint runoff" before it reaches streams (see D-6). Storm drains can deliver to the marsh quantities of water not appropriated to other uses. However stormwater inflow into marshes should be tested for heavy metals and other pollutants which cannot be assimilated by the marsh cleansing process.

8. Uplands around marshes may require seeding and planting to develop a permanent vegetation and grass cover, to provide uplands nesting cover, and to prevent wind and water erosion with resulting deposition in the wetlands.

REFERENCES

This outline of guidelines was prepared by Conservancy staff member, Bruce E. Jones. Unsourced statements are based on input and lessons learned during the planning period, with extensive reliance on the consultant's report, (see Gayman, below). The other references used are:

City of Arcata, Terra Scan, and The State Coastal Conservancy.

California Polytechnic University, Pomona, San Dieguito Lagoon Management Activities, 1976.

Clark, John. Coastal Ecosystems. The Conservation Foundation and John Wiley and Sons, 1977.

Conservation Foundation, Development in Floodplains, 1977.

Council on Environmental Quality, Our Nations Wetlands, 1978.

Council of Environmental Quality, Report on Channel Modifications, Volume I, 1973.

County of San Diego Department of Sanitation and Flood Control and The Smith/Williams Group. San Elijo Lagoon East Basin Water Management Plan, 1976.

Gayman, Wendall; Steve Montgomery, Mitchell Beauchamp. Report on Environmental Baseline Studies For The San Dieguito Lagoon Enhancement Plans, October, 1979.

Harvey, H. T., H. L. Mason, R. Gill, T. W. Wooster. The Marshes of San Francisco Bay: Their Attributes and Values. A Report to the San Francisco Bay Conservation and Development Commission, 1977.

Heath, Dr. James P., "New and Improved Marshes," addendum to BCDC report on Marshes and Mudflats, 1966.

Jones and Stokes, Utilizing Agricultural Drainage for Marsh Management, 1977.

Madrone Associates. Preliminary Biological Assessment of the Triangle Marsh, Corte Madera, June 1978.

City of San Rafael, Staff Report on Seastrand Subdivision, San Rafael, March 28, 1978.

U. S. Army Corps of Engineer's, Vicksburg, Miss. Relevant Criteria for Marsh-Island Site Selection and their Application, 1976.

GLOSS

A

ABATEMENT - Reduction of amount or intensity of a public nuisance, hazard, or pollution.

ACRE FOOT- The volume of water necessary to cover an area of one acre to a depth of one foot (43,560 cubic feet; 325,851 gallons).

AERATION - The process of being supplied or impregnated with air. Aeration is used in waste water treatment to speed up biological and chemical purification.

AGRICULTURAL LAND - Land which is used permanently or during alternating seasons for production of food or fiber (includes grazing lands). PRIME AGRICULTURAL LAND - Land of high suitability for agriculture, according to the SCS and Storie systems for evaluating farmability and soil quality.

ALLUVIUM - Particles of organic and inorganic matter deposited by stream action.

ALLUVIAL FAN - An assemblage of sediments (clay, silt, sand, gravel, or detrital material) deposited where flowing water moves from a steeper to a more gentle gradient and suddenly loses much of its transporting power.

AQUACULTURE - The controlled production of organisms in aquatic systems.

B

BENTHOS - A collective term describing bottom organisms attached or resting on or in the sediments at the bottom of a water body.

BERM - An earthen shelf or ledge on a levee; or landscaped earth barrier, often used for separating and buffering incompatible land uses.

BIOTA - The animal and plant life of a region. See FLORA and FAUNA.

BUFFER - A land area used to separate conflicting or incompatible land uses. See BERM.

C

CARRYING CAPACITY - The maximum population or biomass of a species or intensity of use that any particular area can support over an extended period of time without undergoing deterioration.

CRITICAL HABITAT - An area found by the U.S. Fish and Wildlife Service to be indispensable to the survival of an endangered species.

D

DETRITUS - Organic debris

DISSOLVED OXYGEN - Oxygen dissolved in water. The minimum concentration necessary for survival of many forms of marine life is 4.5 ppm (parts per million).

DRAGLINE - A machine mounted bucket scoop which reaches into an excavation area, drags soil back until full, and then deposits its contents nearby.

DREDGER - Boat which is used to excavate soil from water areas through a suction pipe.

E

ECOLOGICAL RESERVE - As defined in Sections 1580-1584, Fish and Game Code, "areas preserved in a natural condition for the benefit of the general public to observe native flora and fauna and for scientific study".

EIR/EIS - Environmental Impact Report, from the California Environmental Quality Act (CEQA), 1970; Environmental Impact Statement from the National Environmental Policy Act (NEPA), 1969. See also "focused EIR", "impacts", and "negative declaration".

EFFLUENT - A waste or pollution discharge from a specific source.

DANGERED SPECIES - A species of animal or plant is considered to be endangered when its prospects for survival and reproduction are in immediate jeopardy from one or more causes, such as: mortality rate consistently exceeds the birth rate; the species is incapable of adapting to environmental change; habitat is threatened by destruction or serious disturbance; survival is threatened by the unwanted introduction of other species, through predation, competition, or disease; pollution threatens survival. The five endangered species found in California coastal wetlands are: California Least Tern; Belding's Savannah Sparrow; Clapper Rail; Salt Marsh Harvest Mouse; and Morro Bay Kangaroo Rat.

ENVIRONMENT - The combination of all external influences and conditions affecting life, development and ultimate survival of an organism including human beings.

EROSION - The wearing away of the land surface by running water, wind or ice.

ESTUARY - The meeting place of sea and river water; the area in which seawater and freshwater have mutual influence.

F

FAUNA - Animal life. See also FLORA.

FEDERAL FLOOD DISASTER PROTECTION ACT OF 1973 (PL 93-234). Refinement of the Federal Flood Insurance Act which creates strong fiscal incentives encouraging developers and local governments to keep homes out of flood risk (flood prone) areas, or at least build them above the 100-year flood level.

FLOOD, ONE HUNDRED YEAR - A flood having an average frequency of occurrence in the order of once in 100 years with a 1 percent probability that it will occur in any given year (also known as the "intermediate regional flood").

FLOOD PLAIN - The relatively flat area of lowlands adjoining a river, stream, watercourse, ocean, or lake, which has been or may be covered by water.

FLOODWAY - The high velocity flow channel and high hazard portion of a flood plain.

FLORA - Plant life. See FAUNA.

FLYWAY - A vast region with migratory bird breeding grounds and wintering grounds connected with each other by a system of migration routes.

FOCUSED EIR - An informal term for an EIR which is concise, is cross-referenced to existing documents, and addresses only significant impacts.

FOOD CHAIN - A series of plant or animal species in a community, each of which is related to the next as a source of food.

G

GROUNDWATER TABLE - Fluctuating level of groundwater within the earth; high during rainy season, low during dry season.

H

HABITAT, WILDLIFE - Vegetation or land formation which provides fauna with protective cover for nests, dens, mating, feeding, etc.

I

IMPACT, ADVERSE - Damage done to a physical, social or economic situation by a program or project. The EIR/EIS process emphasizes "significant adverse impacts". See also EIR and FOCUSED EIR.

L

LAGOON - A narrow inlet connected to the sea, that extends inland and often has some freshwater entering it, but not to the degree as does an estuary.

LEVEE - A human made embankment to prevent flooding.

MARSH - Periodically wet or continually flooded area with the surface not deeply submerged. Covered dominantly with reeds, cattails, and other hydrophytic plants. Essential habitat for migratory waterfowl, many bird species and mammals. See WETLANDS.

MITIGATION - Actions taken which reduce or compensate for a project's adverse impact on a physical, social, or economic situation.

MASTER ENVIRONMENTAL ASSESSMENT - An EIR-related compilation of data about an area.

N

NPDES - National Pollution Discharge Elimination System. As defined in the Clean Water Act.

NEGATIVE DECLARATION - A brief assessment allowed under CEQA which finds that a proposed project will not harm the environment.

O,P

PICKLEWEED - Common name for Salicornia, a coastal marsh plant which is a primary indicator of a saltwater wetland.

POLLUTANT - Any introduced gas, liquid or solid that diminishes the suitability of a resource for a specific purpose.

POLLUTION - The condition of any system being unable to cleanse itself.

PUBLIC TRUST - A principle of law originating in English common law which establishes an easement in the public interest over the water of the state up to the high water mark.

R

RAPTOR - Bird of prey; a meat-eater.

RARE SPECIES - A species of flora or fauna is rare when any of the following occur: the species is confined to a relatively small and specialized habitat, and incapable of adapting to different environmental conditions; even if found in other parts of the world, it is nowhere abundant; the species is so limited that any appreciable reduction in range, numbers or habitat would cause it to become endangered; if current management and protection programs were diminished in any degree, it would become endangered. See also ENDANGERED SPECIES.

RIPARIAN VEGETATION AND HABITAT - The narrow strip of vegetation that receives its water supply at or near the capillary fringe of the natural water table. Typical species include willow, cottonwood, alder, wild grape. Provides invaluable wildlife cover.

ROOKERY - Breeding ground or colony for gregarious birds and mammals.

RUNOFF - That portion of rain or snow which does not percolate into the ground and is discharged into streams.

S

SECTION 10 and 404 PERMITS - Permits controlling navigational intrusions and landfill in waterways required by Section 10 of the Rivers and Harbors Act of 1899, and Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (now known as the Clean Water Act), and implemented by the Army Corps of Engineers.

SEDIMENTATION - Deposit of small particles carried by water.

STORIE INDEX - A rating of soils denoting their ability to raise crops; based on profile, texture, slope, and modifying features without consideration of agricultural practices to increase soil suitability.

SWAMP CAT - Popular name for a low-ground-pressure form of bulldozer, having very wide tracks which allow it to move over wet ground.

T

TDS - Total Dissolved Solids. Refers to minerals, usually salt, in water.

TIDE - The alternative rising and falling of the surface of all water bodies, especially those connected with ocean, caused by the gravitational pull of the sun and moon occurring unequally on different parts of the earth.

TIDE LANDS - The portion of the ocean shore which is covered and uncovered by the ebb and flow of the tides.

TIDAL DELINEATIONS: MEAN HIGH WATER - The mean height of tidal high waters at a particular station for 18.6 years (usually synonymous with mean high tide); MEAN LOW WATER - The average height of the low waters over a 19-year period; MEAN SEA LEVEL - The average height of the surface of the sea for all stages of the tide over a 19-year period; MEAN TIDE LEVEL - The tidal plane halfway between mean high water and mean low water, synonymous with half tide level; ORDINARY HIGH WATER MARK - Boundary line between public-owned wetlands and privately owned uplands in or along waterways not under influence of tides.

TOPOGRAPHY - Configuration of a surface including its relief and position of natural and man-made features.

TURBIDITY - Condition of water which is thick with rolled sediment.

U,V,W,X,Y,Z

VECTOR - Any species which can create health or safety problems (e.g., rats and mosquitoes).

WETLANDS - Areas that are inundated or saturated by surface or ground water with a frequency sufficient to support a prevalence of plant or animal life adapted to saturated soil conditions.

SELECTED REFERENCES

- o California Polytechnic University. Coastal Design Group.
San Dieguito Lagoon: A report on management alternatives to the City of Del Mar, 1977.
- o Council on Environmental Quality, Our Nation's Wetlands, 1978
- o Department of Fish and Game. Coastal Wetlands Series (20 reports).
- o Gayman, Wendall, Mitchell Beauchamp, and Steve Montgomery. Environmental Baseline Studies for the San Dieguito Lagoon Enhancement Plan. Sea Science Service and Pacific Southwest Biological Services, 1979.
- NOTE: This is the consultants' report supporting the lagoon enhancement program. (It cites 80 references)
- o Jurek, R.M. California Least Tern Recovery Plan. California Department of Fish and Game, 1977.
- o TerraScan. Arcata Marsh Enhancement Plan and Draft Environmental Impact Report. -Phase II. Arcata Marsh Enhancement Project. Prepared for California Coastal Conservancy and City of Arcata. April 30, 1979.

references
glossary



proposed project

Sub-Area Reference Code

For use in locating ground areas when referred to in the text of the plan.



san dieguito lagoon enhancement plan

City of Del Mar, California - State Coastal Conservancy

U.C. BERKELEY LIBRARIES



C101744406